# United States Air Force
# 611th Air Support Group/
# Civil Engineering Squadron

## Elmendorf AFB, Alaska

## Final

## Remedial Investigation and Feasiblity Study

## Point Lonely Radar Installation, Alaska

## (Volume 1 of 2 Includes Appendices A - C)





Prepared by:

ICF Technology Incorporated

01 APRIL 1996

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## PREFACE

This report presents the findings of Remedial Investigations and Feasiblity Studies at sites located at the Point Lonely radar installation in northern Alaska. The sites were characterized based on sampling and analyses conducted during Remedial Investigation activities performed during August and September 1993. This report was prepared by ICF Technology Incorporated.

This report was prepared between January 1995 and April 1996. Mr. Samer Karmi of the Air Force Center for Environmental Excellence was the Alaska Restoration Team Chief for this task. Dr. Jerome Madden and Mr. Richard Borsetti of the 611th CES/CEVR were the Remedial Project Managers for the project.

Approved:

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## EXECUTIVE SUMMARY

### BACKGROUND

The United States Air Force (Air Force) has prepared this Remedial Investigation/Feasibility Study (RI/FS) report as part of the Installation Restoration Program (IRP) to present results of RI/FS activities at 12 sites at the Point Lonely radar installation. The IRP provides for investigating, quantifying, and remediating environmental contamination from past waste management activities at Air Force installations throughout the United States. The IRP is a four-phase program that approximates the remedial investigation (RI) and corrective action program used by the U.S. Environmental Protection Agency (EPA) for addressing contaminated sites that may pose a risk to human health or the environment.

The Air Force initiated IRP activities at the Point Lonely radar installation in 1980 in response to the Department of Defense's (DOD's) commitment to identify past waste disposal sites and eliminate hazards to public health. The initial Phase I conducted by the Air Force concluded that past waste management activities at the installation may have resulted in adverse environmental impacts at one site (CH2M Hill 1981).

An Air Force contractor prepared a Technical Operations Plan for the Phase II, Stage 2 work in August 1986 (Dames and Moore 1987). Phase II, Stage 2 activities involved field investigation of three sites. Five water samples were collected and onsite observations and analytical results were recorded in the Phase II, Stage 2 Draft Report (Dames and Moore 1987).

In January 1987, an Air Force contractor released the Environmental Assessment for North Warning System (Alaska) (Hart Crowser 1987). The assessment, although not an IRP activity, discussed the impacts of the construction of an short range radar (SRR) station at the then-active Point Lonely DEW Line installation.

A private contractor prepared the Environmental Assessment for the North Warning System (Alaska) in January 1987 (Hart Crowser 1987). The report discussed the impacts of retrofitting with long range radar (LRR) equipment at the Point Lonely DEW Line facility.

An Air Force contractor conducted RI/FS Stage 3 activities at the Point Lonely installation, and prepared the Final Work Plan in June 1988 (Woodward-Clyde 1988). The Stage 3 Final Work Plan called for investigation of four sites at the Point Lonely installation. The Stage 3 Final Report of August 1990 recommended remedial of the Large Fuel Spill [(currently identified as Diesel Spills (SS05)] and some remedial action was planned at the Husky Landfill, POL Storage Area, Old Sewage Outfall, and Beach Tanks (Woodward-Clyde 1990a). In September 1990 a contractor released two reports for Stage 3 RI/FS activities, the Final Technical Document to Support a Remedial Action Alternative (for the large Fuel Spill), and the Final Technical Document to Support No Further Action (for the remaining sites at the Point Lonely Installation (Woodward-Clyde 1990b,c).

In 1989, plans for the scheduled closure of the Point Lonely installation were implemented, including concerns about contamination and whether remedial action was warranted. In conjunction with the proposed installation closure, another contractor released an Environmental Impact Assessment for the Point Lonely installation (Radian 1989).

The installation was closed in September 1989. Remediation of the Large Fuel Spill Site, which consisted of gravel pad and tundra areas, was planned to commence in 1991. No documentation of this cleanup was found during the records search for this RI/FS Work Plan.

In preparation for construction activities associated with proposed SRR station at Point Lonely, an Air Force contractor conducted a hydrocarbon soil sampling program (ENSR 1992). A total of 294 screening samples and 36 analytical samples were collected from at least nine areas at the formerly active Point Lonely installation. Petroleum products were detected in several soil samples; complete results are described in the report. Construction of the SRR system was initiated in 1992 and was scheduled to be completed by 1994.

The Air Force initiated RI/FS activities at the Point Lonely radar installation in the summer of 1993. During the initial scoping activities, which included record searches, personnel interviews, and physical inspection of the installation, the Air Force and Alaska Department of Environmental Conservation (ADEC) personnel concluded that 12 sites warranted investigation under the IRP. This document is a detailed presentation of RI activities and provides conclusions and recommendations for addressing environmental conditions at the 12 Point Lonely sites. Remedial actions are recommended for six of the sites, and no further action is recommended for the remaining six sites.

**INSTALLATION DESCRIPTION**

The Point Lonely radar installation is located at 70°54'N, 153°15'W on the north coast of Alaska (Figure 1-1, page 1-5). The 2,830-acre installation is situated approximately one miles west of Pitt Point, a broad point of land extending northward toward the Beaufort Sea. (Figure 1-2, page 1-7).

Point Lonely radar installation, also known as POW-1, was constructed as an auxiliary station in 1953 and was active until 1989. The main station structures include the inactive module train, warehouse, garage, fixed petroleum oils, and lubricants (POL) tanks, pumphouse, radar antennas, and 5,000-foot lighted gravel runway. Parts of the property were previously owned by Husky Oil Company. These areas include an airplane hangar, two warehouses, a control tower, and a tank farm.

Temperatures at the Point Lonely installation are generally low throughout the year, with summer temperatures ranging from approximately 29°F to 44°F and winter temperatures from approximately -25°F to -6°F. Precipitation at Point Lonely averages 4 inches per year; snowfall contributes to a significant of the precipitation. Permafrost at the installation area is up to 1,300 feet thick. Due to the permafrost, polygonal surface patterns are abundant.

The installation is located in an area dominated by the influence of coastal and thaw lake processes, and situated at an elevation of about eight feet above mean sea level (AMSL). The hydrology of the installation is controlled by the relatively low topography and permafrost. Even with the low precipitation rates, the tundra is predominantly swampy.

The geology of the installation is similar to the regional geology. Tundra mat overlies organic-rich peaty horizons that contain silt, with the Barrow unit of the Gubik Formation underlying the organic mats. Soils in the Point Lonely area are moderately frost susceptible due to the high percentage of fine-grained material (Selkregg 1975). Coal, oil, and gas deposits may be present at some depth beneath the facility, but currently have no commercial value.

The vegetative habitat types at Point Lonely support a variety of wildlife. Areas in the vicinity of the installation provide habitat important to birds, mammals, and fish.

**PROJECT ACTIVITIES**

The Air Force conducted RI/FS field activities at 12 sites at the Point Lonely radar installation during 1993. The objectives of the Point Lonely RI/FS were to confirm the presence or absence of chemical contamination of the environment at the installation; define the extent and magnitude of confirmed chemical releases; gather adequate data to determine the magnitude of potential risks to human health and the environment; and gather adequate data to identify and select the appropriate remedial actions for sites where apparent risks exceed acceptable limits.

The RI field activities were carried out in a three-phased approach. The three phases, installation presurvey, reconnaissance, and RI field activities, allowed contractor personnel to confirm the location of areas of environmental concern and identify sampling locations before conducting RI field activities. The sites investigated during the RI activities are:

- Sewage Disposal Area (SS01)
- Drum Storage Area (ST02)
- Beach Diesel Tanks (SS03)
- POL Storage (SS04)
- Diesel Spills (SS05)
- Old Dump Site (LF07)
- Garage (SS09)
- Diesel Tank (West of Hangar) (ST10)
- Inactive Landfill (LF11)/Vehicle Storage Area (SS14)
- Module Train (SS12)
- Hangar Pad Area (SS13)

The site locations are shown on Figure 1-3 (page 1-9).

The RI field activities were conducted from early August through mid-September of 1993. The RI was conducted in conjunction with RIs at seven other radar installations located throughout northern Alaska. Sixteen contractor employees were stationed in Alaska for the duration of the

RI. Sampling activities at the Point Lonely radar installation included collection of surface and subsurface soil samples with hand tools, and collection of surface water, sediment, and seep samples from drainages adjacent to potentially contaminated areas.

A total of 193 samples was collected during the 1993 RI activities at Point Lonely. These included soil, sediment, and surface water samples collected from the 12 sites, upgradient areas to establish background levels, and samples for quality assurance/quality control (QA/QC). A summary of the samples collected is presented in Table ES-1.

Analyses of samples collected during RI activities were conducted by a fixed laboratory in Anchorage, Alaska, and a temporary laboratory set up at Barrow, Alaska. Laboratory analyses conducted by the temporary laboratory were conducted on a quick turnaround basis. Analyses conducted in Anchorage, Alaska, included primarily standard turnaround but also a few quick turnaround analyses.

The Air Force conducted a risk assessment once the data had been validated and compiled. The purpose of the risk assessment was to evaluate the human and ecological health risks that may be associated with chemicals released to the environment at the sites investigated during the RI. The risk assessment characterizes the probability that measured concentrations of hazardous chemical substances will cause adverse effects in humans or the environment in the absence of remediation. The risk assessment will be used in conjunction with state and federal standards and/or guidance to determine if remediation (site cleanup) is necessary. The Point Lonely Risk Assessment (U.S. Air Force 1996) was submitted under separate cover.

## CHRONOLOGY OF ACTIVITIES

Project scoping documents were submitted between June and August 1993 for review by Air Force Center for Environmental Excellence (AFCEE) and regulatory agencies. These documents include the Work Plan, Sampling and Analysis Plan (SAP), Health and Safety Plan, and Community Relations Plan for seven DEW Line installations and Cape Lisburne. The installation Presurvey and the Reconnaissance trips were conducted in order to provide the information necessary to conduct the RI/FS activities. The Presurvey was conducted in May 1993 by a small group of contractor employees accompanied by Air Force representatives.

The Reconnaissance trip was completed in June 1993 by contractor employees, and AFCEE and ADEC representatives. RI field activities were conducted from mid-August through early September 1993. Sampling was conducted from the areas of least contamination to areas of increasing contamination. The sequence of sampling from least to most contaminated was based on previous sampling data, field screening, and visual observations. Field screening was used to assist in determining the areal extent of contamination and sampling locations. Where quick turnaround sample analyses indicated information gaps about the areal extent of contamination, or exposure point concentrations for potentially exposed populations were not defined, a second round of samples was collected and analyzed.

## TABLE ES-1. SUMMARY OF REMEDIAL INVESTIGATION SAMPLING

| SITE | MEDIUM | NUMBER OF ENVIRONMENTAL SAMPLES |
|---|---|---|
| Sewage Disposal Area (SS01) | Soil/Sediment | 23 |
| | Surface Water | 5 |
| Drum Storage Area (ST02) | Soil/Sediment | 11 |
| | Surface Water | 5 |
| Beach Diesel Tanks (SS03) | Soil/Sediment | 7 |
| | Surface Water | 2 |
| POL Storage (SS04) | Soil/Sediment | 5 |
| | Surface Water | 1 |
| Diesel Spills (SS05) | Soil/Sediment | 30 |
| | Surface Water | 7 |
| Old Dump Site (LF07) | Soil/Sediment | 9 |
| | Surface Water | 2 |
| Garage (SS09) | Soil/Sediment | 9 |
| | Surface Water | 2 |
| Diesel Tank (ST10) | Soil/Sediment | 12 |
| | Surface Water | 2 |
| Inactive Landfill (LF11)/ Vehicle Storage Area (SS14) | Soil/Sediment | 7 |
| | Surface Water | 3 |
| Module Train (SS12) | Soil/Sediment | 6 |
| | Surface Water | 2 |
| Hangar pad Area (SS13) | Soil/Sediment | 7 |
| | Surface Water | 3 |
| Background (BKGD) | Soil/Sediment | 4 |
| | Surface Water | 2 |
| Total Environmental Samples | Soil/Sediment | 130 |
| | Surface Water | 36 |

**TABLE ES-1. SUMMARY OF REMEDIAL INVESTIGATION SAMPLING (CONTINUED)**

| SITE | MEDIUM | NUMBER OF ENVIRONMENTAL SAMPLES |
|---|---|---|
| QA/QC SAMPLES | | |
| Ambient Condition Blanks | Water | 2 |
| Equipment Blanks | Water | 6 |
| Trip Blanks | Water | 4 |
| Replicates/Duplicates | Soil/Sediment | 11 |
| | Surface Water | 4 |
| Total Samples | Soil/Sediment | 141 |
| | Surface Water | 52 |

## SUMMARY OF REMEDIAL INVESTIGATION/FEASIBILITY STUDY

The following paragraphs describe RI activities conducted at the 12 sites that are the focus of this report and summarize the findings of the RI. The Inactive Landfill (LF11) and Vehicle Storage Area (SS14) were found to be the same site (i.e., the landfill was covered with gravel and then used as a vehicle storage area); therefore, these sites were investigated and reported in this section as one site referred to as the Inactive Landfill/Vehicle Storage Area. Summaries of human health and ecological risks posed by chemicals detected at each site are included. The remedial alternatives are presented for the sites recommended for cleanup. The evaluation of remedial alternatives is presented in the Feasibility Study (FS), Section 5.0.

**Sewage Disposal Area (SS01).** This site is an old domestic Sewage Disposal Area located on the beach north of the installation and northeast of the Beach Diesel Tanks (SS03) site. The site consists of a beach, gravel road, and tundra on which a pumphouse has been constructed. Two diesel fuel fill pipes, three sewage outfall pipes, and a culvert exist at the site. All diesel fuel lines and sewage outfall pipes are inactive. The western-most diesel fuel pipe leads from the beach, under the road, through the pumphouse, and to the large diesel tank farm (Husky fuel tanks). The eastern diesel fuel fill pipe leads from the beach, below the road, across the tundra, and to the Beach Diesel Tanks. Three inactive sewage outfall pipes and the culvert are located approximately 100 feet east of the Beach Diesel Tanks fuel line and west of the road to the installation.

Sampling and analyses have determined that the Sewage Disposal Area (SS01) site is contaminated with petroleum compounds [diesel range petroleum hydrocarbons (DRPH) and gasoline range petroleum hydrocarbons (GRPH)], benzene, toluene, ethylbenzene, and xylene (BTEX), and other VOCs and a semi-volatile organic compound (SVOC) commonly associated with gasoline and diesel fuel. The contaminated media at the site include soil, gravel pad, tundra, and surface water in the vicinity of the two diesel fuel pipes and associated pumphouse. The source of contamination is suspected to be diesel spills and/or leaks associated with the diesel fuel fill pipes and associated pumphouse. Analytical data indicate that limited onsite contaminant migration has occurred in the active layer.

The risk assessment concluded that risks posed to human health or ecological receptors by site contaminants are minimal given current or future site uses. The risks and hazards are based on a conservative future scenario and are not of a magnitude that normally requires remedial action.

Levels of DRPH, GRPH, and BTEX (total) detected in site soil/sediment exceed ADEC guidance cleanup levels, and contaminants appear to be migrating in the subsurface. Therefore, the site is being recommended for remedial action. The contaminated area at the site consists of approximately 3,333 cubic yards of gravel and 90 cubic yards of tundra. The remedial action alternative recommended for all media at the site is passive bioremediation. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.

**Drum Storage Area (ST02).** The Drum Storage Area (ST02) is located to the west of the Sewage Disposal Area access road adjacent to the turn off to the Beach Diesel Tanks (SS03). This site is an approximately 45-feet by 100-feet elongate raised gravel pad. The site was used for temporary storage of drummed products. During the 1993 reconnaissance, this site appeared to be relatively clean except for an approximately three feet diameter stained area located on the southwest corner of the gravel pad.

Sampling and analyses have determined that the Drum Storage Area (ST02) site is contaminated with petroleum hydrocarbons [DRPH, GRPH, and residual range petroleum hydrocarbons (RRPH)] and VOCs (including BTEX) that are components of diesel fuel. The significantly contaminated area at the site is limited to an approximately three feet diameter stained area located on the southwest corner of the gravel pad. This location has the highest petroleum concentrations, which decrease with distance from the stained area of the gravel pad. The suspected source of contamination is previous spills and/or leaks associated with previous drum storage activities conducted at the site.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The human health risk is not of a magnitude that normally requires remedial action. The ecological risk assessment (ERA) concluded that the overall potential risks presented by site contaminants are minimal. Therefore, under current or future site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of DRPH detected in soil at the site, and BTEX levels in surface water, however, exceed ADEC guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected area at the site is approximately one cubic yard of gravel in an approximately 3-foot-diameter area on the southwest corner of the gravel pad. The remedial action alternative recommended for the gravel pad at the site is passive bioremediation. In addition, during remedial action activities, it is recommended that additional water samples be collected to confirm the absence or presence of BTEX compounds in the surface water at the site of where the 1993 RI surface water sample ST02-SW06 was collected. A complete description and evaluation of the remedial alternatives recommended for this site are presented in the FS, Section 5.0.

**Beach Diesel Tanks (SS03).** This site is located near the beach northwest of the main installation facilities. The site is approximately 250 feet west of the Drum Storage Area and the road leading to the beach. It consists of two diesel tanks and associated piping situated in a bermed enclosure on a gravel pad. The inactive tanks were reportedly cleaned during installation closure activities in 1989. The lined berm around the tanks was breached during closure activities to ensure that water did not fill the bermed area.

Sampling and analyses have determined that the Beach Diesel Tanks (SS03) site is contaminated with petroleum hydrocarbons (DRPH and GRPH) and VOCs (including BTEX) that are primarily associated with diesel fuels. The affected area at the site is limited to an approximately 30-feet by 15-feet elliptical stained area below the piping between the diesel tanks.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The potential human health risks at the site are not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are low. Therefore, under current site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of DRPH and GRPH detected in soil/gravel at the site, however, exceed ADEC guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected volume at the site is approximately 58 cubic yards of gravel between the diesel tanks. The remedial action alternative recommended for the site is passive bioremediation. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.

**POL Storage (SS04)**. The POL Storage site is a gravel pad area located northeast of the Diesel Spills site and adjacent to the road to the beach. This site is a gravel pad placed on relatively flat tundra that was previously used to store POLs. A diesel fuel pipe from the Beach Diesel Tanks runs along the gravel pad tundra border on the west edge of the site. During the 1993 RI, there were one approximately 3,000 gallon jet fuel tank and several 55-gallon drums of other products stored at the site. A small stained area of limited extent was noted on the gravel pad during the 1993 RI.

Sampling and analyses have determined that a small limited area at the POL Storage (SS04) site is contaminated with petroleum hydrocarbons (GRPH, BTEX, and other VOCs that are primarily associated with gasoline and diesel fuels) and solvents. The affected area at the site is the surface water and associated sediments adjacent to the west edge of the gravel pad at the site. The affected area appears to be localized, and migration of contaminants from the site appears to be minimal.

The risk assessment concluded that risks posed to ecological receptors by site contaminants are minimal given current site uses. However, risks and hazards could pose a threat to human health under the future scenario conditions assumed in the risk assessment (U.S. Air Force 1996). The potential human health risks at the site are of a magnitude that normally requires remedial action (i.e, cancer risk $>1 \times 10^{-4}$ and noncancer hazard >1). Therefore, considering the findings of the risk assessment, remediation of the site is recommended.

In addition, levels of GRPH, benzene, cis-1,2-dichloroethene, methylene chloride, tetrachlorethene, trichloroethene, and toluene detected in tundra surface water at the site exceed ADEC and federal guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected area at the site is limited to the surface water in the tundra pond adjacent to the west end of the gravel pad. The remedial action alternative recommended for the site is removal of the 55-gallon drums located on the tundra and gravel pad that are suspected to be the source of the contaminants. The contents of the drums will then be sampled to determine the appropriate action is necessary for drum disposal. If necessary, the drums will be overpacked. In addition, surface water samples will be collected to determine the current water quality at the site and to assess if additional remedial actions are warranted. A complete

description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.

**Diesel Spills (SS05)**. The Diesel Spills (SS05) site consists of two inactive diesel tank farms located approximately 300 feet west of the main installation. The site consists of empty and cleaned diesel tanks, gravel pad, and adjacent tundra areas. The first tank farm consists of two of the installation's original diesel tanks. It was reported that a 25,000-gallon diesel spill occurred south of these two diesel tanks. The second bermed diesel tank farm is located approximately 200 feet west of the first tank farm. This large tank farm consists of six inactive diesel tanks, formerly the Husky Oil tanks. The berm at this tank farm was breached when the tanks were cleaned. Underlying the gravel pad and natural tundra surface are predominantly fine-grained soils typical of the coastal area, with permafrost generally below two feet in the tundra and three to four feet in the gravel pad.

Sampling and analyses have determined that the Diesel Spills (SS05) site is contaminated primarily with petroleum hydrocarbons (DRPH, GRPH, RRPH, and BTEX). The affected areas at the site include the gravel pad and adjacent tundra south of the gravel pad.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The potential human health risks at the site are not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are low. Therefore, under current or future site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of DRPH, GRPH, and benzene detected in soil/sediment and levels of GRPH and benzene in surface water at the site exceed ADEC guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected area at the site includes approximately 233 cubic yards of gravel and approximately 30 cubic yards of tundra. The remedial action alternative recommended for the site is passive bioremediation. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.

**Old Dump Site (LF07)**. This site is an old landfill site used from approximately 1955 to 1976. This inactive landfill is located near the western edge of the lagoon north of the main station facilities and is less than one acre in size. The area has been covered with gravel and graded flat. The lagoon side of the landfill is eroding, and some of the debris is exposed. No additional information on the types of waste disposed of at the site is available.

Sampling and analyses have determined that there is no significant contamination at the Old Dump Site (LF07). Only relatively low levels of contaminants were detected. Their source is suspected to be previous waste disposal at the Old Dump Site, which is no longer active.

There does not appear to be any significant migration of contaminants from the site based on the surface water and sediment samples collected in drainage pathways leading from the site.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. Even using the conservative future scenario, the potential human health risks at the site are not of a magnitude that normally requires remedial action. Based on the RI sampling and analyses, risk assessment, and current or future site uses, remedial actions are not warranted at the site. No significant human health or ecological risks were identified at the site. Therefore, the Old Dump Site is recommended for no further action.

**Garage (SS09)**. The Garage (SS09) site is located approximately 100 feet northeast of the module train. The Garage is an approximately 100-foot by 40-foot building elevated about three feet above the tundra and is surrounded by gravel on all sides. The building was used for vehicle maintenance and storage. Floor drains in this building discharged directly to the tundra beneath the structure and may have received vehicle maintenance waste; however, the site has been inactive since 1989. Culverts lead from under the Garage to the tundra north and west of the gravel pad surrounding the Garage.

Sampling and analyses have determined that the Garage (SS09) site is contaminated with petroleum hydrocarbons (DRPH, GRPH, and RRPH), BTEX compounds, and other VOCs. Some metals (inorganics) detected at the site at slightly elevated levels are also considered to be chemicals of concern (COCs). The contaminated areas at the site are soil/sediment and surface water. The soil/sediment areas beneath the site building have the highest concentrations of contaminants. The source of contamination is suspected to be POL wastes discharged to floor drains in the Garage.

Migration of contaminants from the site appears to be very limited. Contaminants detected in the sediment sample collected from the mouth of the west culvert leading from the Garage were similar to those detected below the Garage building, however, concentrations were much lower. Contaminants were not detected in a drainage pathways downgradient of the culverts indicating that contaminant migration is minimal.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. This human health risk is not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential ecological hazard from site contaminants is low. Therefore, considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of petroleum compounds (primarily DRPH, GRPH, and RRPH) and BTEX detected in soil/sediment at the site, however, significantly exceed ADEC guidance cleanup levels. Therefore the suspected source area at site, the area beneath the building, is being recommended for remedial action. The contaminated area at the site consists of approximately 167 cubic yards of soil beneath the building. The remedial action alternative recommended for beneath the building is passive bioremediation. A complete description and evaluation of the remedial alternative recommended for this site are presented in the FS, Section 5.0.

**Diesel Tank (ST10)**. The Diesel Tank (ST10) site is the former location of a 20,000-gallon fuel tank located east of the module train and southwest of the new SRR technical services building.

The site consists of tank supports and the associated pumphouse in a bermed gravel area located on the south edge of the gravel pad. The gravel pad and berm at the site are raised approximately three feet above the tundra, which is located south of the site. No records have indicated historical spills in the area, but previous sampling and analysis, conducted in 1989 by an Air Force contractor, indicate the presence of petroleum hydrocarbon contaminated soils.

Sampling and analyses have determined that there is no significant contamination at the Diesel Tank (ST10) site. Only low levels of contaminants were detected in a limited area adjacent to the pump house valve and surrounding berm. The source is suspected to be previous leaks and/or spills associated with the diesel tank that was formerly located at this site. The installation is presently unmanned and the diesel tank has been removed. Therefore, there is no longer a source of potential contaminants at the site. Migration of contaminants from the site appears minimal based on samples collected downgradient of the site.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The human health risk is not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential ecological risks presented by site contaminants are minimal. Therefore, considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Based on the RI sampling and analyses and the risk assessment, remedial actions are not warranted at the site. No significant human health or ecological risk was identified at the site. Therefore, the Diesel Tank (ST10) site is recommended for no further action.

**Inactive Landfill (LF11)/Vehicle Storage Area (SS14).** The Inactive Landfill is located along the west side of the road to Freshwater Lake in the same location as the Vehicle Storage Area (SS14). This landfill was active until the installation closure in 1989. The landfill is covered with a gravel cap and a gravel pile is present at the site.

The Vehicle Storage Area (SS14) is co-located with the Inactive Landfill. This site, like the Inactive Landfill, has been regraded and otherwise modified such that its shape in 1993 differed substantially from that indicated on earlier site maps. A second gravel pad north of the largest pad making up the Inactive Landfill site (LF11) was tentatively identified as the Vehicle Storage Area; however, there was no discernable boundary so these two areas were sampled as one site.

Sampling and analyses have determined that there is no significant contamination at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14). Only very low levels of contaminants were detected. The source, although unknown, is possibly isolated spills or leaks caused by previous vehicle storage activities at the site, or from previous waste disposal practices. The installation and site are presently inactive, so waste is no longer being disposed at the site. Analytical data indicate that migration of contaminants from the site is minimal.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The very low potential hazards and risks are based on a future scenario in which the site surface water would be used as a sole-

source drinking water supply. Even using the conservative future scenario, the potential risks at the site are not of a magnitude that normally requires remedial action.

Based on the RI sampling and analyses and the risk assessment, remedial actions are not warranted at the site. No significant human health or ecological risk was identified at the site. Therefore, the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site is recommended for no further action.

**Module Train (SS12)**. This site is located below and adjacent to the west end of the Module Train, below the diesel generators and diesel day tanks. The site consists of the gravel pad and tundra, and is in the area of a previous diesel spill.

Sampling and analyses have determined that there is no significant contamination at the Module Train (SS12) site. Only relatively low levels of contaminants were detected. Their source is suspected to be previous spills and/or leaks from the day tanks at the west end of the Module Train. The Module Train is no longer active.

There does not appear to be any significant migration of contaminants from the site based on the surface water and sediment samples collected in drainage pathways leading from the site.

There were no COCs identified for soil/sediment or surface water in either the human health or ecological risk assessment. Therefore, risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses.

Based on the RI sampling and analyses, risk assessment, and current or future site uses, remedial actions are not warranted at the site. No significant human health or ecological risks were identified at the site. Therefore, the Module Train (SS12) site is recommended for no further action.

**Hangar Pad Area (SS13)**. This site is located approximately 600 feet west of the Garage (SS09) site and south of the airstrip. It consists of an inactive hangar, surrounding gravel pad area, and a 1,000-gallon POL storage tank on the east side of the hangar. The POL tank has been reported to have been cleaned (Radian 1989).

Sampling and analyses have determined that there is no significant contamination at the Hangar Pad Area (SS13) site. Only relatively low levels of contaminants were detected. Their source is suspected to be previous spills and/or leaks from the 1,000-gallon POL storage tank west of the hangar. There does not appear to be any significant migration of contaminants from the site based on the sediment samples collected downgradient of the site.

No COCs were identified in the human health or ecological risk assessment for either the soil/sediment or surface water matrices at the site; therefore, the risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. Based on the RI sampling and analyses, risk assessment, and current or future site uses, remedial actions are not warranted at the site. No significant human health or ecological risks

were identified at the site. Therefore, the Hangar Pad Area (SS13) site is recommended for no further action.

## CONCLUSIONS

To meet the Air Force's commitment to identify, quantify, and remediate waste disposal sites at installations throughout the United States, the prime contractor completed an RI/FS at 12 sites at the Point Lonely radar installation. The investigation was completed in accordance with the guidelines established in the Air Force's IRP. The RI/FS involved field investigations, sampling, and analysis at 12 sites at the Point Lonely radar installation.

Based on the RI sampling, data analyses, and quantitative risk assessment, the Air Force has concluded there is no human health or ecological risk associated with observed conditions and recommends no further remedial action for six of the 12 sites. These sites, presented in Table ES-2, are the Old Dump Site (LF07), Diesel Tank (ST10), Inactive Landfill (LF11)/Vehicle Storage Area (SS14), Module Train (SS12), and Hangar Pad Area (SS13). At the remaining six sites contaminant levels may represent a potential risk to receptor populations or exceed ADEC cleanup guidance levels. It is recommended that remedial actions be conducted at these sites: Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), POL Storage (SS04), Diesel Spills (SS05), and Garage (SS09). The remedial action alternatives recommended for these six sites are presented in Table ES-3.

## TABLE ES-2. SITES RECOMMENDED FOR NO FURTHER ACTION

| SITE NAME | SITE ID NUMBER |
|---|---|
| Old Dump Site | LF07 |
| Diesel Tank | ST10 |
| Inactive Landfill/Vehicle Storage Area | LF11/SS14 |
| Module Train | SS12 |
| Hangar Pad Area | SS13 |

## TABLE ES-3. SITES RECOMMENDED FOR REMEDIAL ACTION

| SITE | SITE ID NUMBER | MEDIA | RECOMMENDED ALTERNATIVE |
|---|---|---|---|
| Sewage Disposal Area | SS01 | • Gravel<br>• Tundra | Enhanced Bioremediation |
| Drum Storage Area | ST02 | • Gravel | Enhanced Bioremediation |
| Beach Diesel Tank | SS03 | • Gravel | Enhanced Bioremediation |
| POL Storage | SS04 | • Tundra | Characterization and Offsite Disposal of Drums |
| Diesel Spill | SS05 | • Gravel<br>• Tundra | Enhanced Bioremediation |
| Garage | SS09 | • Soil beneath the Garage | Enhanced Bioremediation |

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# 1.0 INTRODUCTION

The Air Force has prepared this RI/FS report to present the results of RI/FS activities at 12 sites located at the Point Lonely radar installation. The RI field activities were conducted at the Point Lonely radar installation during the summer of 1993. The 12 sites at Point Lonely were investigated because they were suspected of being contaminated with hazardous substances. The RI/FS was conducted in accordance with the requirements of the Air Force IRP. RI activities were conducted using methods and procedures specified in the RI/FS Work Plan, Sampling and Analysis Plan, and Health and Safety Plan (U.S. Air Force 1993a,b,c).

Section 1.0 of this report presents information concerning the objectives and implementation of the IRP, a description of the installation and the environmental setting at Point Lonely, and brief background information on the 12 Point Lonely sites. Project activities, including project objectives and scope, summaries of field and laboratory methods, methodologies for data evaluation and risk estimation, and a summary of background sampling, analytical results, and migration pathways are described in Section 2.0. Section 3.0 documents the RI sampling and analysis results on a site-by-site basis for the six sites where no further action is recommended, identifies potential migration pathways and receptors, summarizes the human health and ecological risks, and describes the conclusions and recommendations for each of these sites. Section 4.0 documents the RI sampling and analysis results on a site-by-site basis for the six sites where remedial actions may be warranted; identifies all Applicable or Relevant and Appropriate Requirements (ARARs), potential migration pathways, and receptors; summarizes the human health and ecological risks; and describes the conclusions and recommendations, including the recommended remedial alternative, for cleanup at each of the sites. Section 5.0 presents the Feasibility Study (FS) of potential remedial actions for the sites that may require cleanup.

The recommended actions for each of the sites, presented in Sections 3.0 through 5.0, are preliminary. The actions for each site will be determined only after review of this RI/FS document and the Point Lonely Risk Assessment (U.S. Air Force 1996) by regulatory agencies and interested parties. During the decision process, the public will be notified through fact sheets and public notices as to the recommended action for each site and will be given the opportunity to comment on the proposed action for each site.

Appendix A provides references and a list of acronyms used in this document. Appendix B presents photographs of the Point Lonely radar installation and sites. Appendix C is the Statement of Work describing the scope of the RI/FS activities at the Point Lonely radar installation. Sample collection logs are presented in Appendix D; sample Chain-of-Custody forms are in Appendix E. Cross-reference tables and analytical data are presented in Appendix F, and data validation reports are in Appendix G.

## 1.1 THE UNITED STATES AIR FORCE INSTALLATION RESTORATION PROGRAM

The Air Force IRP is the basis for assessment and response action on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The Air Force IRP is designed to identify, confirm/quantify, and remedy problems associated with past and present management of hazardous substances and hazardous wastes at Air Force facilities. CERCLA defines a hazardous substance in Section 101; the definition includes, as examples, any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act (FWPCA), any element, compound, mixture, solution, or substance designated pursuant to Section 102 of CERCLA, and hazardous wastes identified pursuant to Section 3001 of the Resource Conservation and Recovery Act (RCRA). A hazardous waste, as defined in RCRA, "may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of or otherwise managed" (Section 1004[2][B] of RCRA).

The DOD initiated the IRP in 1976 to identify, investigate, and mitigate environmental hazardous waste contamination that may be present at DOD facilities. In June 1980, DOD issued Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6, requiring identification of past hazardous waste disposal sites at DOD agency installations. The Air Force implemented DEQPPM 80-6 in December 1980 and revised it in 1981.

Executive Order 12316 of 14 August 1981 directed the military to design its own program to remedy uncontrolled hazardous waste disposal sites consistent with the National Contingency Plan (NCP) established by CERCLA. In response to the directive, the DOD instructed its branches to identify hazardous waste disposal sites to which they contributed wastes, and to comply with environmental regulations at the installation level when implementing cleanup. DOD subsequently developed the basic IRP after which the Air Force IRP was modeled. DEQPPM 81-5 of 11 December 1981, implemented by Air Force Headquarters in January 1982, sets forth the basic authority and objectives for the Air Force programs.

The Superfund Amendments and Reauthorization Act of 1986 (SARA) augmented the scope and requirements of CERCLA and provided specific directives to federal facilities regarding investigation of waste disposal sites. Under SARA, technologies that provide permanent removal or destruction of hazardous wastes or contaminants are preferable to actions that only contain or isolate the materials. SARA also provides for greater interaction with public and state agencies and expands the role of the EPA in the evaluation of the health risks associated with contamination. SARA requires early determination of ARARs and the consideration of potential remediation alternatives at the initiation of an RI/FS. Remedial actions taken under CERCLA must comply with ARARs, which generally consist of federal, state, and local regulations. Remedial actions at facilities regulated under CERCLA are selected based on the results of an RI/FS. The RI/FS process is described in the NCP. The RI phase includes specific steps for determining the nature and extent of environmental contamination. Subsequently, the FS is implemented to evaluate alternative remedial actions prior to selection of the most appropriate action for a specific facility.

To respond to changes in the NCP brought about by SARA, the Air Force modified its IRP in November 1986 to improve continuity in the site investigation and remedial planning process for Air Force installations. In July 1987 the President signed Executive Order 12580, delegating responsibility to secretaries of various agencies to conduct site investigations and remedial actions at federal facilities. The order defined relationships between various federal and state agencies and assigned EPA the role of facilitator in resolving conflicts.

Prior to 1988 the Air Force IRP was organized into four phases, described below:

- Phase I, Installation Assessment/Records Search, identified past waste disposal sites at Air Force installations that might pose a hazard to public health or the environment. Sites identified during Phase I could be recommended for no further action, confirmation studies (Phase II), or remedial action (Phase IV).

- Phase II, Confirmation/Quantification, was intended to define and quantify contamination present at sites identified during Phase I. Stage 1 of Phase II consisted of an initial assessment, including environmental sampling, to determine whether contamination was present. Depending on the results of Stage 1, subsequent stages of investigation could be recommended to improve the characterization of site contamination.

- Phase III, Technology-Based Development, included development of new technologies for treating contaminants identified at Air Force installations. The results of Phase II investigations were used to determine the need for Phase III activities.

- Phase IV, Remedial Action, involved development and implementation of plans to remedy contamination at sites.

In 1988, the Air Force replaced the phased approach of the IRP with an approach more closely resembling the RI/FS approach used by EPA. Under this approach, Phase II investigations and Phase IV remedial action planning are conducted in a more parallel fashion to expedite implementation of site cleanups.

## 1.2 INSTALLATION DESCRIPTION AND ENVIRONMENTAL SETTING

The Point Lonely radar installation, also known as POW-1, was constructed as an auxiliary station in 1953 and was active until 1989. It was staffed from 1958 until 1989. The Point Lonely DEW Line installation is one of many DEW Line installations located across the arctic regions of North America and Greenland. The installations were designed to operate and maintain radar systems for the detection of aircraft that may be a threat to national security.

The Point Lonely installation is located near Pitt Point between Smith and Harrison Bays, on the Beaufort Sea. The station occupies 2,830 acres with no nearby villages. The main station structures include the inactive module train, warehouse, garage, fixed POL tanks, pumphouse,

radar antennas, and 5,000-foot lighted gravel runway. The module train contained the sanitary wastewater treatment facility, potable water treatment facility, diesel power generators, rotating radar equipment including the radome, recreational facilities, dining facilities, and incinerator. Parts of the property were previously owned by Husky Oil Company. These areas include an airplane hangar, two warehouses, a control tower, and a tank farm. The facility is totally self-contained.

The short range radar (SRR) system under construction during the 1993 RI activities is currently operational. The new radar system is designed for unmanned operation and consists of a radar structure, support building, and a helicopter landing area.

A variety of past activities at the installation may have resulted in environmental contamination. The Air Force is investigating and remediating actual and potential sources of contamination through activities conducted under the IRP.

### 1.2.1 Physical Geography

The Point Lonely radar installation is located at 70°54'N, 153°15'W on the north coast of Alaska. The 2,830-acre installation is situated approximately one mile west of Pitt Point, a broad point of land extending northward toward the Beaufort Sea. The general location of Point Lonely radar installation is shown on Figure 1-1. An area location map is presented in Figure 1-2, and a site plan is provided on Figure 1-3.

### 1.2.2 Climate (Meteorological Conditions and Air Quality)

At the Point Lonely installation, precipitation averages approximately four inches per year. At Barrow, less than 100 miles to the west, average daily minimum and maximum temperatures in summer are 29°F and 44°F, respectively. In winter, these temperatures are -25°F and -6°F, respectively. Temperature extremes for the period of record (1959 to 1974) were -56°F and 78°F (Selkregg 1975).

Because of very sparse development and the associated lack of major air pollution sources, air quality in the area is good. Air inversions are common, and the persistent light winds along the coastal plain prevent the development of air masses containing pollutants.

### 1.2.3 Geology

This section presents information on the regional and local geology of the Point Lonely area.

**1.2.3.1 Regional Geology**. Geologic units of all the principal time-stratigraphic systems from Precambrian to Quaternary are represented in Alaska. For the last two or three million years, frost climates have prevailed in Alaska and the geomorphic processes have been either periglacial or glacial (Wahrhaftig 1965). Although glacial activity was extensive, it was by no means all-encompassing. Glaciation is evident in many parts of the state including the Pacific Mountain System, Arctic Mountains, Ahklun Mountains, and southern Seaward Peninsula. Some

1


ARCTIC OCEAN
Barrow
Point Barrow
Dease Inlet
Peard Bay
Smith Bay
Point Lonely
Harrison Bay
Cilktok Point
Wainwright
Icy Cape
Point Lay
Cape Lisburne
Point Hope
CHUKCHI SEA
Alaska Maritime National Wildlife Refuge
Kivalina
Cape Krusenstern National Monument
RUSSIA
UNITED STATES
Kotzebue
KOTZEBUE SOUND
Shishmaref
Cape Espenberg
Deering
Big Diomede Island
Little Diomede Island
Prince of Wales
Cape Prince of Wales
Wales
Port Clarence
Teller
King Island
Cape Douglas
SEWARD PENINSULA
BERING
Gambell
Savoonga
SAINT LAWRENCE ISLAND
Nome
Cape Nome
Norton Bay
NORTON SOUND
Stuart Island
Stebbins
Unalakleet
BERING SEA
Emmonak
Alakanuk
Pastol Bay
Scammon Bay
Cape Romanzof
Hooper Bay
Mountain Village
Chevak
Saint Matthew Island
Hazen Bay
Yukon Delta National Wildlife Refuge
Nelson Island
Mekoryuk
Nunivak Island
Yukon Delta NWR
Baird Inlet
Bethel
Kwethluk
Kipnuk
Quinhagak
KUSKOKWIM BAY
Goodnews Bay
Platinum
Togiak
Cape Newenham
Togiak Bay
Hagemeister Island
Cape Constantine
Kvichak Bay
Dillingham
Iliamna Lake
Saint Paul Island
Saint Paul
PRIBILOF ISLANDS
Saint George
Saint George Island
BRISTOL BAY
Pilot Point
Port Heiden
Herendeen Bay
Chignik Bay
Perryville
Sutwik Island
Semidi Islands
Chirikof Island
Izembek National Wildlife Refuge
Cold Bay
Unimak Island
Unimak Pass
Ikatan Bay
King Cove
Sand Point
Stepovak Bay
Shumagin Islands
Unga
Nagai
Sanak Islands
Anchorage
Spenard
Kenai
Soldotna
Seward
Homer
Anchor Point
Seldovia
Augustine Vol
Kennedy Entrance
Stevenson Entrance
Barren Islands
Shuyak Island
SHELIKOF STRAIT
Kodiak
KODIAK ISLAND
Kodiak National Wildlife Refuge
Sitkinak Strait
Trinity Islands
Afognak Island
Blying Sound
GULF
PACIFIC OCEAN
Denali National Park and Preserve
Mt McKinley
BEAUFORT
Bullen Point

2

# LEGEND

▲ RADAR SITE

**ALASKA REMOTE RADAR INSTALLATION**

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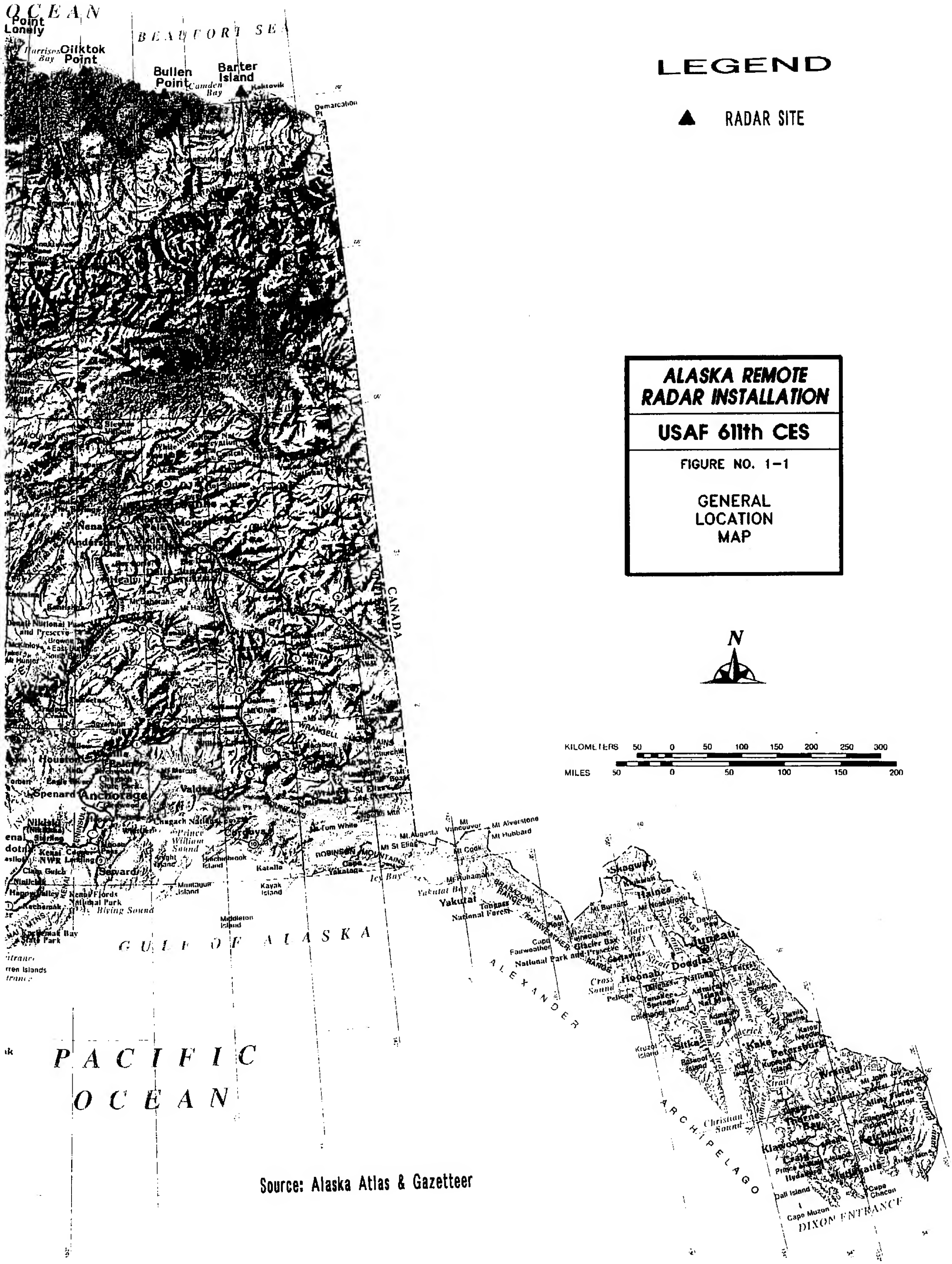
FIGURE NO. 1-1

GENERAL LOCATION MAP




Source: Alaska Atlas & Gazetteer

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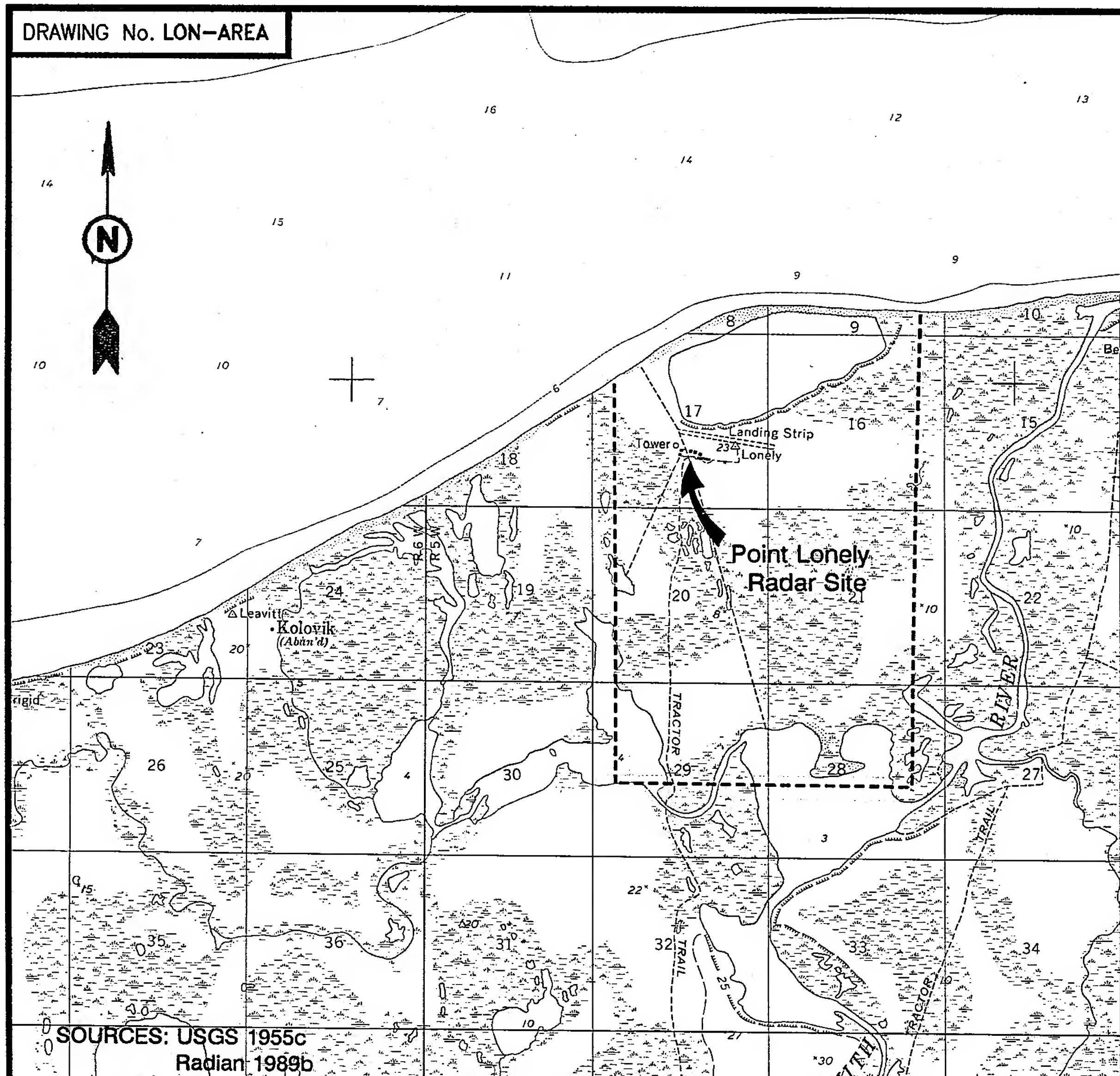


**POINT LONELY RADAR INSTALLATION**

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FIGURE NO. 1–2

AREA LOCATION MAP

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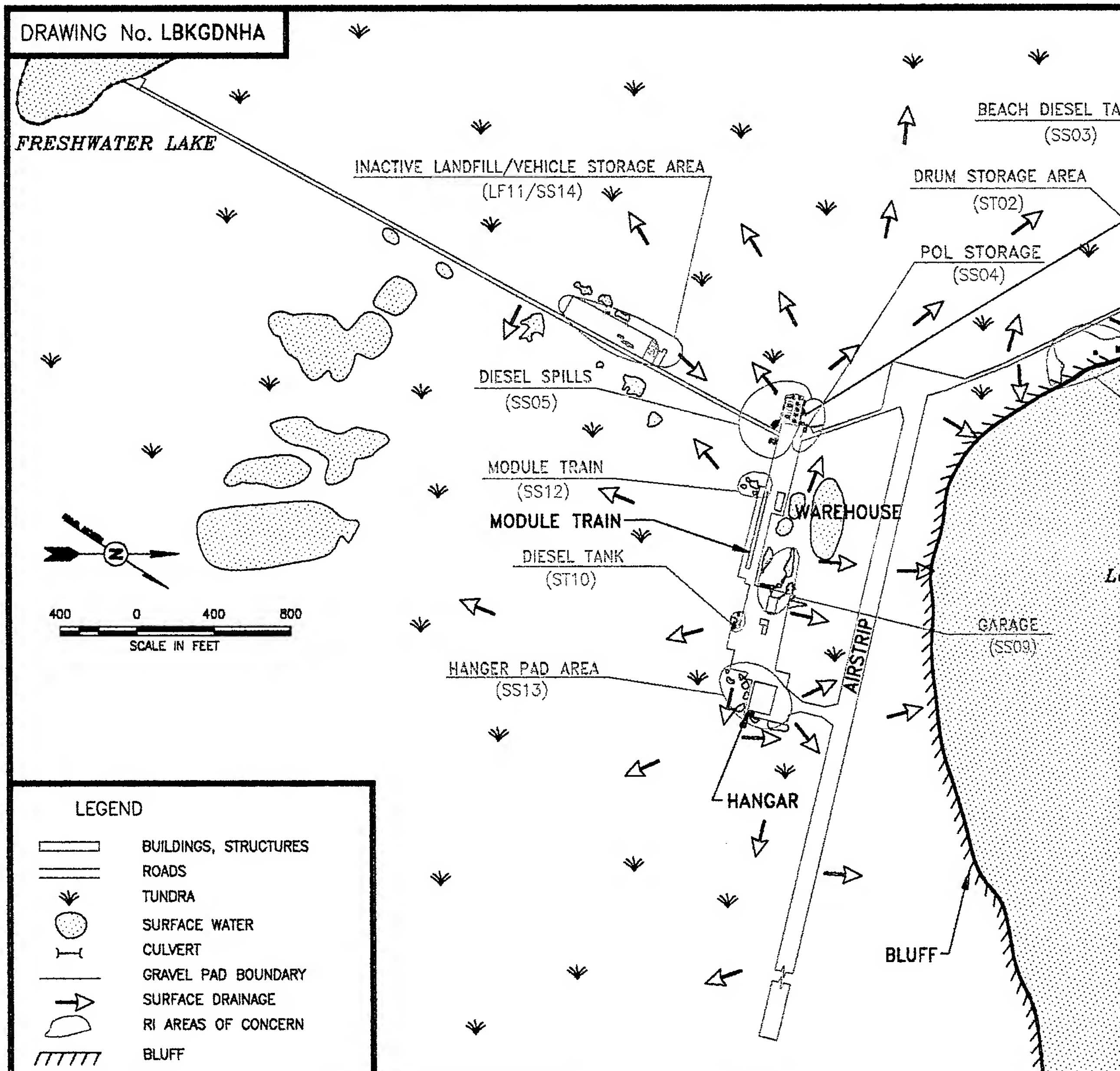


**POINT LONELY RADAR INSTALLATION**

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FIGURE NO. 1-3

INSTALLATION SITE PLAN

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great expanses, however, received no glacial activity. The principal areas not glaciated include the Intermountain Plateaus, Arctic Foothills, and Arctic Coastal Plain. Many periglacial features such as polygonal ground, sorted circles, pingos, and ice wedges can be observed on the Arctic Coastal Plain. Figure 1-4 depicts the extent of Alaska's glacial areas.

Alaska's generally cold climatic regime has produced permafrost, a combination of geologic, hydrologic, and meteorologic characteristics that produces permanently frozen ground. Permafrost occurs in both unconsolidated sediments and bedrock; its distribution includes most of the state, with the notable exception of the Pacific coastal area. Permafrost is continuous on the Arctic Coastal Plain and has a significant impact on the flow of ground water and surface water. The distribution of Alaska's permafrost areas is shown on Figure 1-5. Permafrost is discussed in detail in Section 1.2.4.1.

The very strong geologic processes at work in Alaska have produced a unique environmental setting reflected in the general geology of the Arctic Region (Figure 1-6). A popular theory of the formation of the Arctic Region is that it was once an ocean basin adjacent to the Canadian Shield. Rifting of the Canadian Shield occurred during Mesozoic time, and the Arctic Region drifted southwest forming the Colville Basin to the south and the Arctic Ocean to the north. At the same time, the Brooks Range orogeny began creating a source for the newly-created Colville Basin. Continued uplift of the Brooks Range produced a prograding delta that filled in the Colville Basin.

**1.2.3.2 Local Geology**. The Point Lonely installation is located on Pitt Point, a broad point of land extending northward toward the Beaufort Sea, at an elevation ranging from about 6 to 24 feet above MSL. The installation is on a low, broad, east-west trending hill, approximately 1.4 miles long and up to about 0.5 miles wide. A large, shallow salt-water lagoon is situated between the installation and the Beaufort Sea, with bluffs on the south side of the lagoon up to 20 feet high. The coastal erosion rate may reach 98 feet per year (Hopkins and Hartz 1978; BLM 1981). Swampy, ponded areas surround the station to the west and south, and the Smith River flows northward to the sea approximately 1.8 miles to the east.

The geology of the installation is similar to that discussed in the regional overview (see Section 1.2.3.1). Tundra mat overlies organic-rich peaty horizons that contain silt, with the Barrow unit of the Gubik Formation underlying the organic mats. Soils in the Point Lonely area are moderately frost susceptible due to the high percentage of fine-grained material (Selkregg 1975).

Coal, oil, and gas deposits may be present at some depth beneath the facility, but currently have no commercial value.

This area tends to be relatively free of historic earthquakes. Faults or folds that displaced Pleistocene deposits, however, were detected at the continental shelf margin about 42 miles north of the installation where Holocene sediments were reported not to have been disturbed (Grantz et al. 1980 1982).

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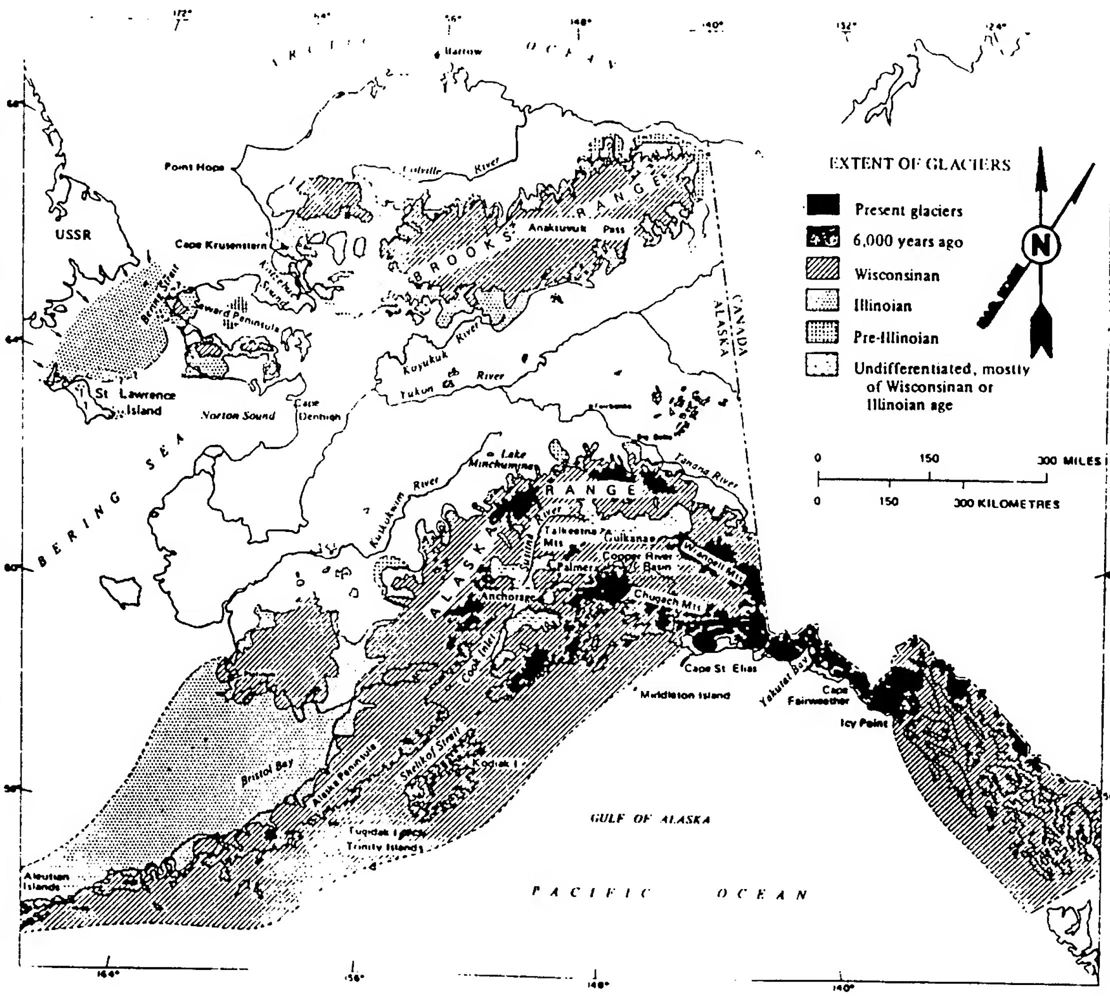


SOURCE: Pewe 1975

**ALASKA REMOTE RADAR INSTALLATIONS**

**USAF 611th CES**

FIGURE NO. 1-4

QUATERNARY GLACIATION IN ALASKA

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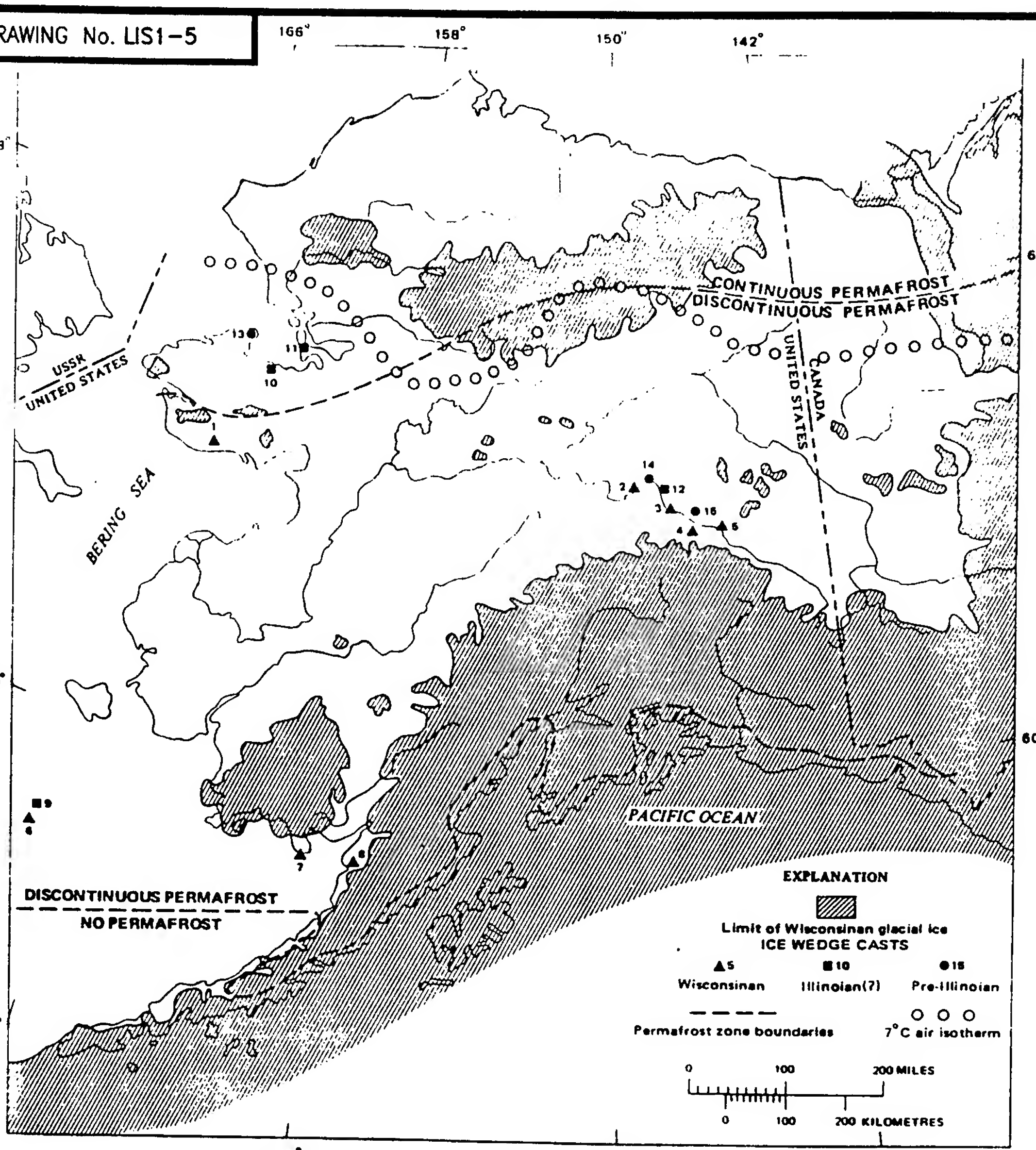


# ALASKA REMOTE RADAR INSTALLATIONS

## USAF 611th CES

FIGURE NO. 1-5

PERMAFROST MAP

SOURCE: Pewe 1975

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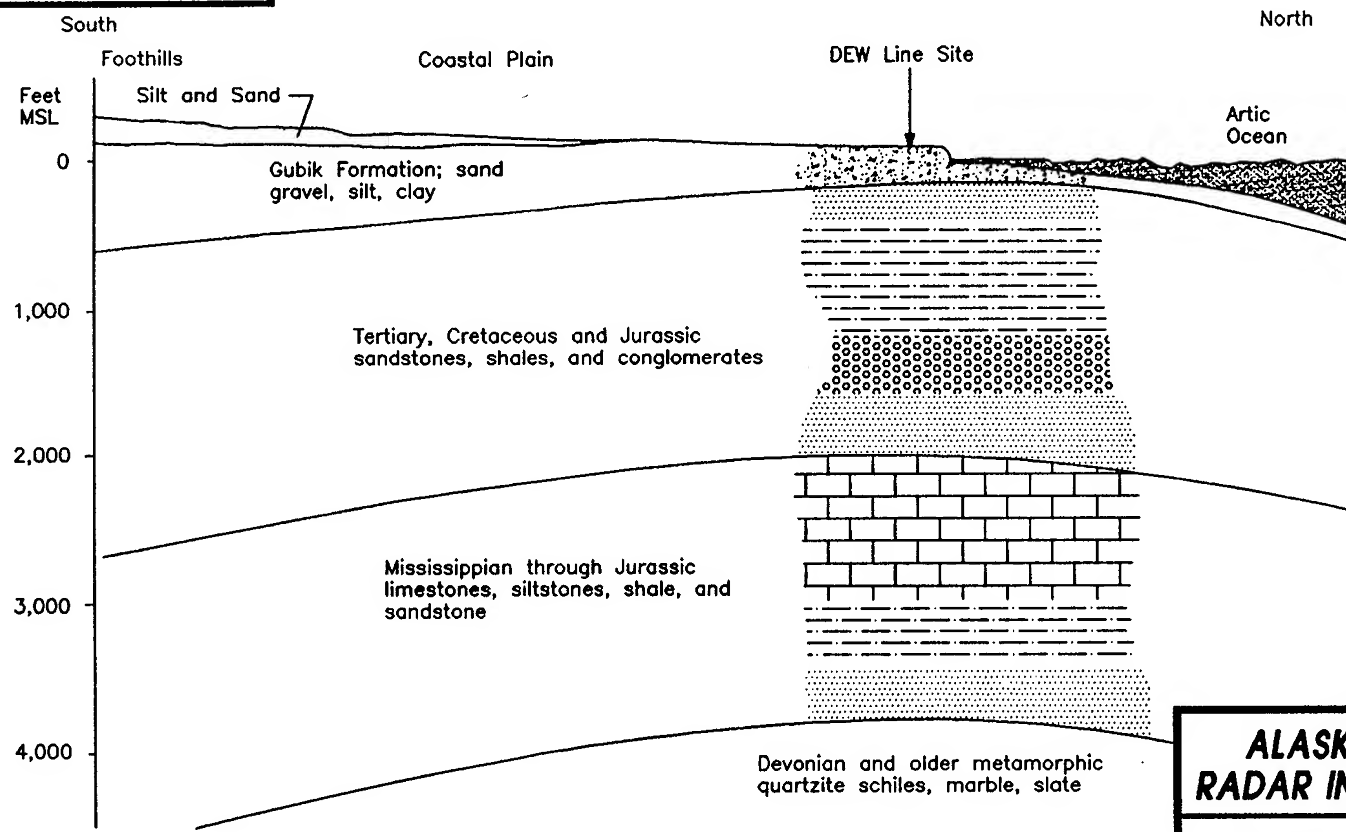


SOURCE: CH2M HILL 1981

Not to Scale

**ALASKA REMOTE RADAR INSTALLATIONS**

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FIGURE NO. 1-6

GENERALIZED NORTH-SOUTH GEOLOGIC CROSS SECTION

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### 1.2.4 Hydrology

Ground water/permafrost and surface water are discussed in the following sections.

**1.2.4.1 Ground Water/Permafrost.** Permafrost has a profound influence on Alaska's ground water resources. Permafrost is defined by the *Glossary of Geology* (American Geological Institute 1972) as:

- Any soil, subsoil, or other surficial deposit, or even bedrock, occurring in arctic or subarctic regions at a variable depth beneath the earth's surface in which a temperature below freezing has existed continuously for a long time (from two years to thousands of years). This definition is based exclusively on temperature and disregards the texture, degree of compaction, water content, and lithologic character of the material.

Permafrost has a major impact on the relationship between surface water and ground water in cold regions such as Alaska. Although ground water in permafrost regions follows the same geologic and hydrologic principles as in temperate areas, the hydrologic regime is modified in the following ways:

- Permafrost acts as an impermeable barrier to the movement of ground water because pore spaces are ice-filled in the zone of saturation. Recharge and discharge are, therefore, limited to unfrozen channels penetrating the permafrost zone. The unfrozen channels are termed perforating taliks. Permafrost restricts the downward percolation of water and increases runoff, enhancing the creation of lakes and swamps (Feulner et al. 1971).

- Permafrost zones tend to reduce evapotranspiration. The generally low ground temperatures tend to reduce direct evaporation and transpiration (the escape of moisture through plant tissue into the air). Vegetation growth is enhanced near large surface water bodies where permafrost usually occurs at greater depth.

- Permafrost restricts an aquifer's storage capacity and the number of locations from which ground water may be withdrawn. Subpermafrost ground water occurs beneath the permafrost zone and is usually dependable. Suprapermafrost water occurs in the active zone, above the permafrost table, and tends to be seasonal; it freezes during the cold winter months.

- The ground water temperature varies from 32 to 40.1°F in permafrost regions because of the low ground temperatures (Williams 1970). Water tends to be more viscous in this temperature range and, therefore, moves slower than in temperate regions.

Low ground temperatures create the necessary environment for permafrost to form. The segment above the permafrost table is called the active zone, because it freezes and thaws with seasonal

weather changes. The permafrost zone remains frozen year-round. The active zone is significant because suprapermafrost active zone water exists within it.

Ground water has been found in aquifers beneath the continuous permafrost, but little is known of these aquifer systems. Shallow ground water sources are also present in river gravel and in thaw bulbs beneath deep lakes. Active zone water is found during the summer months when this layer thaws, but the layer is relatively thin. The thickness of the active zone at Point Lonely ranged from one to six feet during the 1993 RI.

Surface features may have dramatic impacts on the subsurface distribution of permafrost because they influence heat transfer. Heat flow through surface water is greater than through land. Permafrost may be discontinuous or present at greater depth under and near large bodies of water such as rivers or deep lakes. Smaller bodies of water may affect the configuration of the permafrost surface or the total thickness of the permafrost at any given point. Figure 1-7 is a generalized representation of the relationship of surface features to the underlying permafrost.

**1.2.4.2 Surface Water**. The Point Lonely installation lies about 0.6 miles from the Beaufort Sea. The drainage is radial, away from the facility. Surface drainage occurs as sheetflow and ephemeral streams and may drain into larger streams or directly to the ocean. The surface water drainage features in the vicinity of the installation are shown on Figure 1-8.

A large, shallow, east-northeast-trending salt-water lagoon over 1.2 miles long and 0.5 miles wide lies northeast of the installation. Swampy terrain with low-centered polygons borders the installation to the west and south. Several small ponds adjacent to the hill on which the installation lies occupy a northwest-trending, elongated ice wedge depression. The swampy and ponded area south of the facility drains into the northward-flowing Smith River.

When the installation was active potable water was obtained from a lake approximately 3,900 feet from the facility. In the winter, this small lake freezes to the bottom, so water must be obtained from a larger, deeper lake approximately six miles away. Another lake, in essence a wide spot in the Smith River located about 9,000 feet south of the facility, was designated as a possible future potable water source.

### 1.2.5 Industrial Activities

Primary industrial activities at the installation include operation and maintenance of the unmanned radar system. The Point Lonely radar installation was built to support the air defense system in Alaska. The installation was constructed in 1953 when communications were provided by high frequency radio. The original equipment still remains but was replaced with new Short Range Radar system, which is currently operational. The installation is unmanned except for periodic maintenance of the active radar system.

Presently, the installation consists of an active Short Range Radar tower, a technical services building, and a warehouse and an inactive module train, rotating radar, garage, warehouse, POL tanks, air terminal building, and runway. The inactive module train contained the electronic equipment work areas and the radar tower, personnel quarters, administration offices, a

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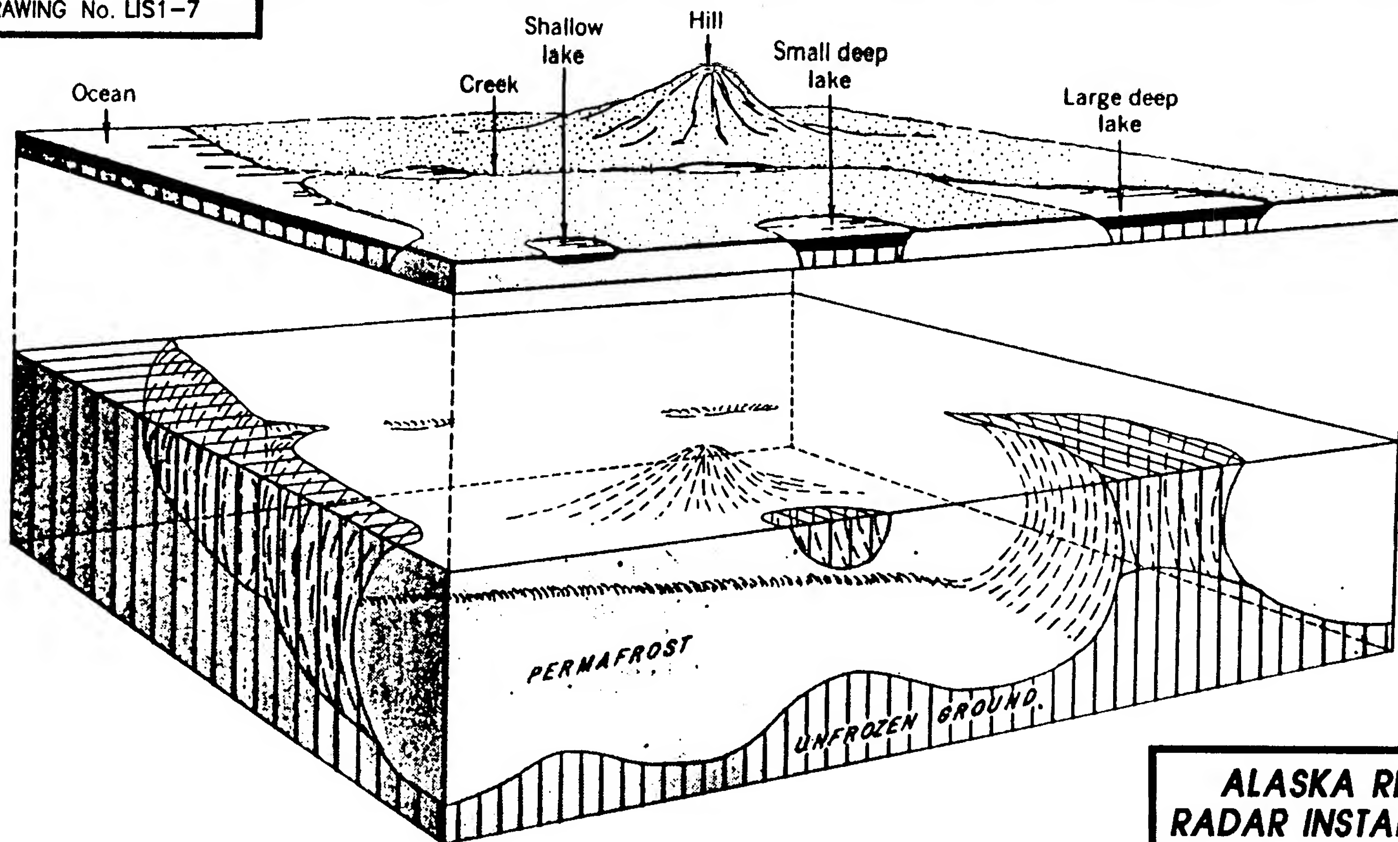


SOURCE: Selkregg 1975

**ALASKA REMOTE RADAR INSTALLATIONS**

**USAF 611th CES**

FIGURE NO. 1-7

SURFACE FEATURE IMPACTS ON PERMAFROST DISTRIBUTION

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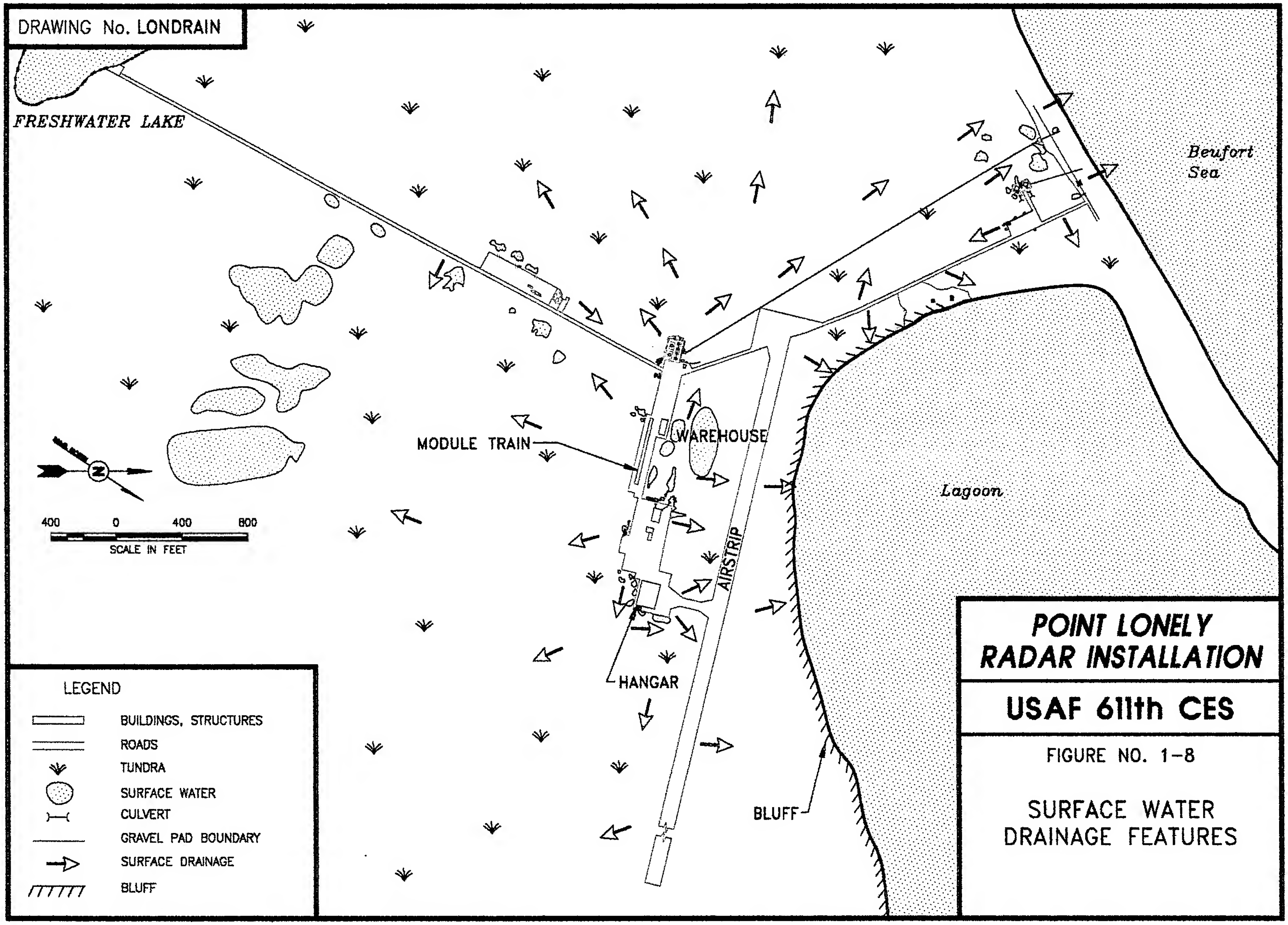
DRAWING No. LONDRAIN
FRESHWATER LAKE
Beufort Sea
Lagoon
MODULE TRAIN
WAREHOUSE
AIRSTRIP
HANGAR
BLUFF
400 0 400 800
SCALE IN FEET
LEGEND
BUILDINGS, STRUCTURES
ROADS
TUNDRA
SURFACE WATER
CULVERT
GRAVEL PAD BOUNDARY
SURFACE DRAINAGE
BLUFF
POINT LONELY
RADAR INSTALLATION
USAF 611th CES
FIGURE NO. 1-8
SURFACE WATER
DRAINAGE FEATURES

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mechanical room with emergency boiler and fuel storage, a personnel support module with water storage, shower, toilets, dining, kitchen, and recreation areas.

### 1.2.6 Biology

This section presents information on the regional fauna and flora of the Point Lonely area.

**1.2.6.1 Vegetation**. Wetlands, predominantly wet sedge and flooded tundra, are the characteristic habitat types in the Point Lonely region. Vegetation is dominated by forms associated with wet sedge/aquatic tundra, particularly *Carex aquatilis* and other sedges and grasses grading into pendent grass, *Arctophila fulva*, in deeper ponds and lakes. Elevated polygon rims provide a microhabitat for species such as arctic bluegrass, *Poa arctica*; Labrador tea, *Ledum palustri*; polar grass, *Arctagrostis latifolia*; and willows, *Salix* spp. Plants associated with marine zones (wet sedge saline varieties and coastal beach communities) are found north of the installation. Representative species in the marine zone include the sedge, *Carex subspathacea*; lyme grass, *Elymus arenarius*; and alkali grass, *Puccinellia phyrganodes* (Hart Crowser 1987; NPRA 1978; Bergman et al. 1977).

**1.2.6.2 Fishes**. Freshwater and anadromous fishes are likely to use the interconnected lakes and ponds of the Smith River system for spawning, rearing, and feeding activities. Representative species of the area are arctic cisco, *Coregonus autumnalis*; arctic char, *Salvelinus alpinus*; grayling, *Thymallus arcticus*; nine-spined stickleback, *Pungitius pungitius*; and Alaska blackfish, *Dallia pectoralis* (NPRA 1978).

**1.2.6.3 Birds**. The area around Teshekpuk Lake, located about 15 miles south-southwest of the installation, is considered to contain some of the best waterbird breeding, molting, and premigratory staging habitat in arctic Alaska (Derksen et al. 1981). Several million migratory birds of at least 150 species use the area during their migratory cycle. Principal breeding birds include arctic loon, *Gavia arctica*; red-throated loon, *G. stellata*; whistling swan, *Olor columbianus*; brant, *Branta bernicla*; Canada goose, *B. canadensis*; eiders, *Somateria* spp.; pintail, *Anas acuta*; oldsquaw, *Clangula hyemalis*; American golden plover, *Pluvialis dominica*; black-bellied plover, *P. squatarola*; long-billed dowitcher, *Limnodromus scolopaceus*; dunlin, *Calidris alpina*; pectoral sandpiper, *C. melanotos*; semipalmated sandpiper, *C. pusillus*; red phalarope, *Phalaropus fulicarius*; and northern phalarope, *P. lobatus*. The Lapland longspur, *Calcarius lapponicus*, is the principal breeding passerine; some are thought to overwinter in the area. Year-round residents also include snowy owl, *Nyctea scandiaca*; common raven, *Corvus corax*; snow bunting, *Plectrophenax nivalis*; and willow ptarmigan, *Lagopus lagopus* (Hart Crowser 1987; USFWS 1982).

**1.2.6.4 Mammals**. Terrestrial mammals are represented by those species typically associated with wet tundra. Masked shrew, *Sorex cinereus*; brown lemming, *Lemmus trimucronatus*; collared lemming, *Dicrostonyx groenlandicus*; microtine rodents, *Microtus* spp.; weasels, *Mustela* spp.; and arctic fox, *Alopex lagopus*, occur in the vicinity of the installation (Hart Crowser 1987). Barren-ground caribou, *Rangifer tarandus*, of the Teshekpuk Lake herd, range throughout the area, with principal calving grounds located to the southwest, along the western edge of Teshekpuk Lake.

Marine mammals found in the waters offshore of Point Lonely include gray whale, *Eschrichtius robustus*; bowhead whale, *Balaena mysticetus*; beluga, *Delphinapterus leucas* and ringed seal, *Phoca hispida*. Gray whale, bowhead whale, and beluga pass the area on their annual migrations, and ringed seal are associated with the shear zone between the pack ice and shorefast ice during the winter. Polar bear, *Ursus maritimus*, may visit the area during the winter, occasionally preying on ringed seal in the area during the winter, but are present less often in the summer.

**1.2.6.5 Threatened and Endangered Species**. Threatened and endangered species potentially occurring in the vicinity of the Point Lonely installation include spectacled eider, *Somateria fischeri* (threatened); Steller's eider, *Polysticta stelleri* (candidate for listing); and bowhead whale (endangered). According to surveys done by Alaska Biological Research (1994), the spectacled and Steller's eider were recently identified near the Point Lonely installation, and potentially suitable habitats for nesting or brood-rearing are present. The bowhead whale may pass offshore of the installation during migration. The arctic peregrine falcon, *Falco peregrinus tundrius*, and gray whale, two previously listed species with potential to occur near the installation, were delisted by the U.S. Fish and Wildlife Service as of 5 October 1994, and by the National Marine Fisheries Service as of 16 June 1994, respectively.

### 1.2.7 Demographics

The Point Lonely installation is very isolated with no station personnel and no native settlements in the area. The closest community is Nuiqsut, approximately 75 miles southeast. The community of Barrow is located approximately 85 miles northwest. The installation was deactivated in 1989. Access to the installation is by air and sea, but air transportation is the only year-round access.

**1.2.7.1 Cultural Resources.** Table 1-1 lists archeological, historical, and traditional sites found in the vicinity of Point Lonely. These sites have not been evaluated for listing in the National Register of Historic Places. Historic camps and native allotment claims in the vicinity relate to the abundance of waterfowl, particularly geese, and available fish resources.

The Point Lonely DEW Line installation is located at the eastern edge of the identified subsistence use area for Barrow (Hart Crowser 1987). The primary resources used for subsistence in the area include fish, waterfowl, and caribou.

**1.2.7.2 Recreation**. Recreation in the vicinity of the Point Lonely installation is very limited due to the almost complete lack of accommodations, facilities, and transportation in the area, as well as the extreme climatic conditions. The only year-round access is by charter aircraft. Teshukpuk Lake, about 15 miles southwest of the station, provides opportunities for sport fishing during limited portions of the year. Other recreational pursuits include camping, hiking, and wildlife viewing. Most of the hunting, fishing, and camping done in the area by North Slope natives is subsistence-oriented.

**TABLE 1-1. KNOWN CULTURAL RESOURCE SITES IN THE VICINITY OF POINT LONELY RADAR INSTALLATION[a]**

| SITE NAME | TLUI #[b] AHRS # | DESCRIPTION | LOCATION |
|---|---|---|---|
| Kolovik (Qaluvik) | 39 -- | Historic trapping, trading site. Contains collapsed structures, two shale boats, four surface burials. | Coast of Beaufort Sea about three miles southwest of the Point Lonely installation. |
| Kokruagarok | -- -- | Fishing, hunting, camping area. | 3 miles east of the Point Lonely installation. |
| Mitittvak (Drew Point) | 21 -- | Graves, hunting, camping area. | 17 miles west of the Point Lonely installation. |
| Imaguak (Anakruak) | 20 -- | Cabins, graves, sod ruins. | 19 miles southwest of the Point Lonely installation. |
| Kinniviak | 36 -- | Hunting, camping area. | About 20 miles southwest of the Point Lonely installation. |

a Data from Hall (1977); Hoffman et al. (1978); and Davis et al. (1981).
b TLUI = Traditional Land Use Inventory.
AHRS = Alaska Heritage Resources Survey.
Source: Hart Crowser 1987

## 1.3 SITE INVENTORY

This section presents information on the IRP sites at the Point Lonely radar installation. It includes summaries of previous IRP activities and remedial actions that have been conducted at the installation.

### 1.3.1 Sites at Point Lonely

Twelve sites at the Point Lonely radar installation were investigated during the 1993 RI activities. Ten sites were determined to be of concern based on previous IRP sampling data. Additionally, there were two sites identified for investigation based on previous IRP activities and the 1993 RI activities. The ten sites previously sampled are the Sewage Disposal Area (SS01), Beach Diesel Tanks (SS03), POL Storage (SS04), Diesel Spills (SS05), Old Dump Site (LF07), Garage (SS09), Diesel Tank (ST10), Inactive Landfill (LF11), Module Train (SS12), and Hangar Pad Area (SS13). Previous IRP sampling at these areas determined that contaminants were present. Additional sites were identified based on previous IRP activities as listed: literature search, pre-survey and reconnaissance, communication with personnel from ADEC, and information on disposal practices at DEW Line stations. The additional sites include the Drum Storage Area (SS02) and

the Vehicle Storage Area (SS14). Prior to this RI/FS, no sampling had been conducted at these two sites.

It should be noted that none of the sites is on or is proposed to be included on the National Priority List (NPL) of Superfund sites.

### 1.3.2 Previous IRP Activities

An Air Force contractor conducted Phase I Installation Assessment/Records Search activities at the Point Lonely installation and six other DEW Line stations in 1980 and 1981 (CH2M Hill 1981). Phase I activities included a detailed review of pertinent installation records from both government and civilian contractors, contacts with various government and private agencies for documents relevant to the program, and onsite visits during July and August 1981. The onsite visits included interviews with key installation employees, ground tours of installation facilities, and plane overflights to identify past disposal and possible contaminated areas.

An Air Force contractor conducted Stages 1 and 2 of the Phase II Confirmation/Quantification activities (Dames and Moore 1986, 1987). Phase II, Stage 1 activities involved field investigations of specific sites that were identified in the Phase I Installation Assessment/Records Search activities. Surface water samples were collected from three sites at the inactive Point Lonely installation during the field investigation.

An Air Force contractor prepared a Technical Operations Plan for the Phase II, Stage 2 work in August 1986 (Dames and Moore 1987). Phase II, Stage 2 activities involved field investigation of three sites. Five water samples were collected (Dames and Moore 1987). Onsite observations and analytical results were recorded in the Phase II, Stage 2 Draft Report.

In January 1987, an Air Force contractor released the Environmental Assessment for North Warning System (Alaska) (Hart Crowser 1987). The assessment, although not an IRP activity, discussed the impacts of the construction of an SRR station at the then-active Point Lonely DEW Line installation.

By 1988, the Air Force had replaced the phased approach with an approach more similar to the RI/FS activities of EPA. An Air Force contractor conducted RI/FS Stage 3 activities at the Point Lonely installation, and prepared the Final Work Plan in June 1988 (Woodward-Clyde 1988). The Stage 3 Final Work Plan called for investigation of four sites at the Point Lonely installation including subsurface soil investigation, surface water and sediment sampling, possible removal actions, hydrologic assessment, a demographic survey, an endangerment assessment (health risk assessment), and an FS for remedial alternatives. The Stage 3 Final Report for August 1990 recommended remediation of the Diesel Spill (SS05) (Large Fuel Spill) and some remedial action was planned at the POL Storage (SS04), Old Sewage Outfall (SS01), and Beach Diesel Tanks (SS03) (Woodward-Clyde 1990a). In September 1990 a contractor released two reports for Stage 3 RI/FS activities, the Final Technical Document to Support a Remedial Action Alternative (for the Large Fuel Spill), and the Final Technical Document to Support No Further Action (for the remaining sites at the Point Lonely installation) (Woodward-Clyde 1990b,c).

In 1989, plans for the scheduled closure of the Point Lonely installation were implemented, including concerns about contamination and whether remedial action was warranted. In conjunction with the proposed installation closure, another contractor released an Environmental Impact Assessment for the Point Lonely installation (Radian 1989b). The Environmental Impact Assessment involved a records search, interviews with installation personnel, photos, an installation survey, an electromagnetic survey to detect buried metal objects, and soil and standing water analysis for heavy metals, hydrocarbons, VOCs, priority pollutants, and PCBs. The installation was closed in September 1989. Remediation of the Large Fuel Spill Site, which consisted of fill and tundra areas, was planned to commence in 1991. No documentation of this cleanup was found during the records search for the 1993 RI/FS Work Plan.

In preparation for construction activities associated with proposed radar stations at Point Lonely, an Air Force contractor conducted a hydrocarbon soil sampling program (ENSR 1992). A total of 294 screening samples and 36 analytical samples were collected from at least nine areas at the formerly active Point Lonely installation. Petroleum products were detected in some of these soil samples; complete results are described in the report. Construction of the SSR systems was initiated in 1992 and was scheduled to be completed by 1994.

### 1.3.3 Previous Remedial Actions

There are no remedial actions taking place at this time, and there are no known remedial actions previously conducted at the Point Lonely installation.

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## 2.0 PROJECT ACTIVITIES

This section of the report describes the project objectives and scope, the RI field program and methodology, the analytical programs, background sampling, and analytical results. In addition, data evaluation, risk estimate methodologies, potential migration pathways, and receptors are presented.

### 2.1 PROJECT OBJECTIVES AND SCOPE

The objectives of the Point Lonely DEW Line radar installation RI/FS are to confirm the presence or absence of chemical contamination in the environment at the installation; define the extent and magnitude of confirmed chemical releases; gather adequate data to determine the magnitude of potential risks to human health and the environment; and gather adequate data to identify and select the appropriate remedial actions for sites where apparent risks exceed acceptable limits or contamination exceeds regulatory guidelines. The project objectives include the following goals:

- Define the horizontal and vertical extent of soil/sediment contamination and the range of contaminant concentration;
- Determine the physical and chemical properties of soil/sediment contaminants to describe contaminant toxicity and mobility;
- Define the extent of surface and active zone water contamination and the range of contaminant concentrations;
- Describe real and potential surface and subsurface contaminant migration pathways in terms of movement of dissolved and suspended contaminants through the active zone above permafrost, and movement of dissolved and suspended contaminants in surface water;
- Generate adequate valid data to support development of a baseline risk assessment that quantifies, to the extent possible, potential risks to human health and the environment posed by COCs at the Point Lonely DEW Line installation studied under this RI; and
- Select the most feasible remedy, cleanup action, to reduce risks at sites where risks exceed acceptable limits.

### 2.2 RI FIELD ACTIVITIES

This section presents a summary of the field activities conducted during the RI, the organization of the RI field team, and the chronology of field work.

### 2.2.1 RI Field Program

The RI field program at the Point Lonely radar installation was carried out in accordance with the RI/FS Work Plan, the Sampling and Analysis Plan, and the Health and Safety Plan (U.S. Air Force 1993a,b,c). These RI/FS planning documents were developed as specified in the Delivery Order No. 22 Statement of Work (Appendix C) and IRP Handbook (U.S. Air Force 1991).

The scope of the field investigation was described in detail in the Sampling and Analysis Plan (U.S. Air Force 1993b). The field activities included the following:

- Collecting and analyzing surface and subsurface soil samples and sediment samples from sites with potential or confirmed contamination. These samples were described and analyzed for petroleum and other chemical residues. Samples were collected using hand tools.

- Collecting and analyzing samples of surface water from potentially affected streams, surface water features such as lakes or ponds, and any apparent leachate discharge points.

- Collecting and analyzing background soil, sediment, and surface water samples to characterize natural background conditions.

- Measuring relative surface elevations of sampling points and stream channels to determine surface slopes and stream gradients.

- Collecting samples of potential chemical residues and waste materials at sites where such materials were suspected and had not yet been characterized.

- Conducting real-time air monitoring using portable field instruments.

- Measuring surface distances and approximate elevations to locate sampling points relative to fixed reference points.

The RI activities described above were carried out in three phases as follows:

- Installation Pre-Survey. The pre-survey was conducted by a small group of contractor employees (four total) accompanied by Air Force representatives. The purpose of the pre-survey was to confirm the location of areas of environmental concern at the installation. Pre-survey activities were limited to visual inspection of the sites, surface distance measurements, site photography, and confirmation of the location of structures and sites as shown on installation plan maps. The information gathered from the pre-survey was combined with existing documentation to support development of the RI/FS scoping documents. The pre-survey was completed at the Point Lonely installation on 12 May 1993 by an Air Force contractor.

- Installation Reconnaissance. The installation reconnaissance was conducted by a group of contractor employees on 26 June 1993. The purpose of the reconnaissance was to identify sampling locations for investigation during the RI. The contractor staff made detailed observations of potentially contaminated areas and performed limited intrusive activities (e.g., digging shallow holes with a shovel to determine the apparent depth of contamination at areas of soil staining). Data gathered during the installation reconnaissance provided the basis for determining the sites to be sampled, the approximate number of samples and their locations, analyses for each sample, and equipment and supply needs for the RI.

- Remedial Investigation Field Activities. The RI field activities were conducted from mid-August through early September of 1993. The RI was conducted in conjunction with RIs at seven other radar installations located throughout northern Alaska. Fifteen contractor employees were stationed in Alaska for the duration of the RI. Sampling activities at the Point Lonely radar installation included collection of surface and subsurface soil samples with hand tools (e.g., shovels, scoops, and bucket augers) and collection of surface water, sediment, and seep samples from potentially contaminated areas. The RI activities also included operation of temporary northern Alaska (Barrow, Alaska) laboratory facilities operated by a subcontractor.

### 2.2.2 Field Team Organization and Subcontractors

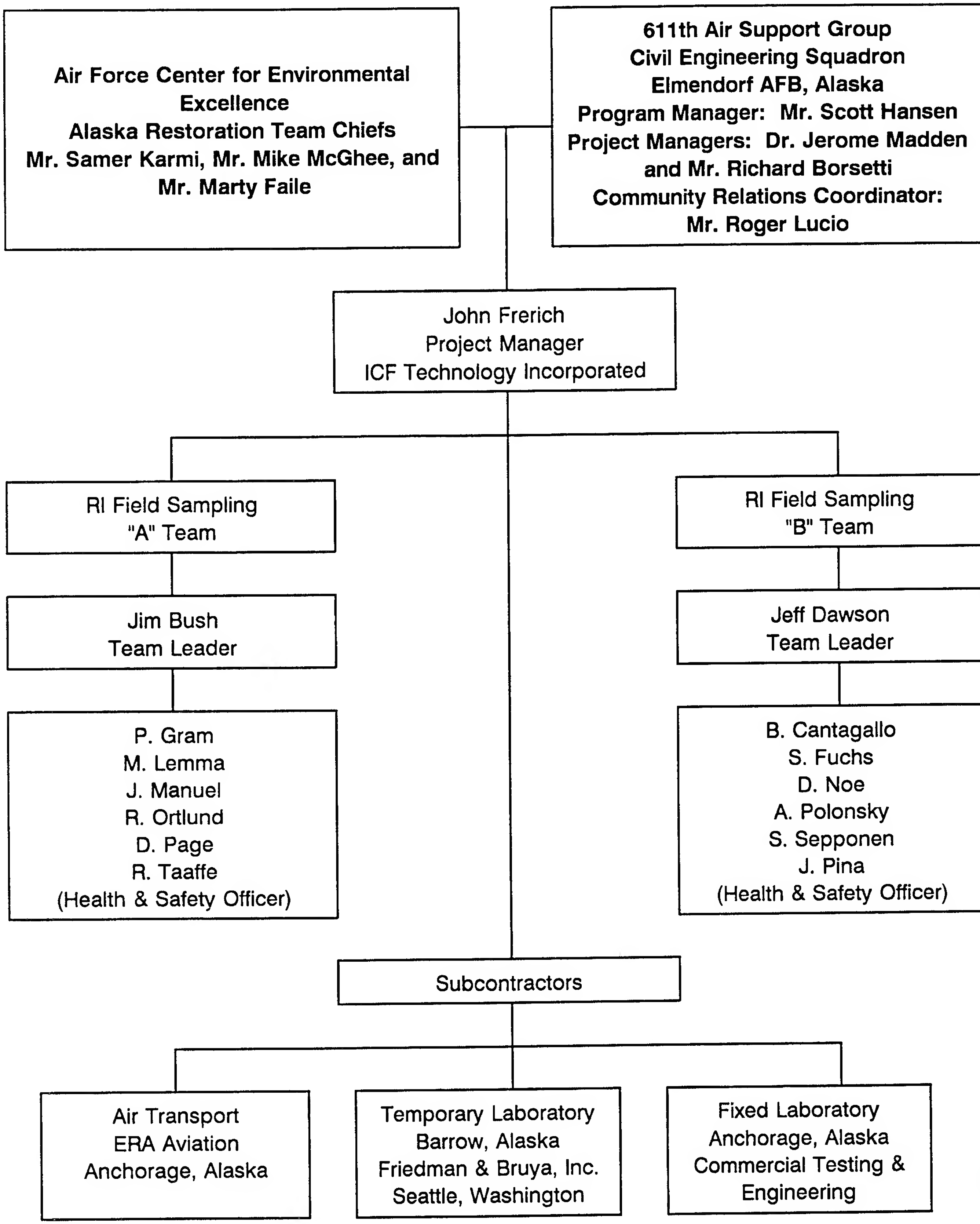
The organization of the RI field team, the responsibilities of the RI team members, and subcontractors used during RI activities are presented in Figure 2-1 (Note: all Point Lonely sampling was conducted by the A RI Field Sampling Team). The AFCEE restoration team chiefs that managed and conducted oversight of the RI field activities included Mr. Marty Faile, Mr. Mike McGhee, and Mr. Samer Karmi.

### 2.2.3 Chronology of Field Work

The RI field work at the Point Lonely radar installation conducted during summer 1993 was accomplished in the following chronological order:

| | |
|---|---|
| 12 May | Conducted on site pre-survey |
| 26 June | Conducted on site reconnaissance |
| 13 August | Staked sampling locations at SS01, ST02, SS05, LF07, and SS09. |
| 14 August | Staked sampling locations at SS01, SS04, SS05, SS10, LF11, SS12, and SS13. |

FIGURE 2-1. FIELD TEAM ORGANIZATION



| | |
|---|---|
| 24 August | Collected six soil and two water samples at SS03, four soil samples and one water sample at SS04, four soil samples and one water sample at SS12, and four quality assurance/quality control (QA/QC) samples. |
| 25 August | Collected 24 soil and 7 water samples at SS05, 3 soil and 2 surface waters background samples, and 7 QA/QC samples. |
| 26 August | Collected 17 soil and 5 water samples at SS01, 2 soil and 1 water sample at ST02, 7 soil samples and 1 water sample at LF07, 7 soil and 3 water samples at LF11, and 7 QA/QC samples. |
| 27 August | Collected six soil and four water samples at ST02, one water sample at LF07, six soil and two water samples at SS09, seven soil and two water samples at ST10, four soil and three water samples at SS13, and seven QA/QC samples. |
| 4 September | Collected six soil samples at SS01, three soil samples at ST02, one soil sample at SS03, two soil samples at SS04, seven soil samples at SS05, and two QA/QC samples. |
| 5 September | Collected two soil samples at LF07, three soil samples at SS09, two soil samples and one surface water sample at SS12, three soil samples at SS13, five soil samples at ST10, one background soil sample, and one QA/QC sample. |

## 2.3 RI SAMPLING AND ANALYSES

A summary of the RI sampling and analysis activities conducted during this investigation is presented in this section. Included are descriptions of the number of samples collected by media, QA/QC samples collected, background sampling and analyses, analytical programs, chronology of laboratory analyses, laboratory QA/QC programs, and data validation and reporting.

### 2.3.1 Sampling Procedures

Contractor personnel collected samples from various media at the Point Lonely radar installation using numerous sample collection methods and procedures. The collection methods were determined at the time of collection, based on sample location and prevailing environmental conditions. Media sampled during the RI included surface and subsurface soils, surface water, and sediment. These media were extracted generally from man-emplaced fill, gravel pads, and scraped areas; and natural tundra soils/sediments and surface water bodies. All sampling tools or other devices used during sampling were decontaminated before use. Standard procedures, developed by the contractor for sampling methodologies used during the RI are presented in Appendix D of the RI/FS SAP (U.S. Air Force 1993b). Sample collection logs for all samples

collected during RI activities at the Point Lonely installation are presented in Appendix D. The logs provide detailed sample information such as media, location, depth, and analyses requested. Completed chain-of-custody forms for all samples collected during the RI at the Point Lonely installation are presented in Appendix E.

### 2.3.2 Summary of RI Sampling

Contractor personnel collected 193 samples from various media at the Point Lonely radar installation. Six samples were collected to determine organic and inorganic background concentrations in soil/sediment and surface water. Twenty-seven samples were collected for QA/QC. QA/QC samples included duplicates, replicates, equipment rinsate blanks, trip blanks, and ambient condition blanks. One hundred and sixty samples were collected to determine the nature and extent of contamination at the 12 sites at Point Lonely. Table 2-1 presents a summary of RI sampling conducted at Point Lonely.

**2.3.2.1 Field QA/QC Samples**. The field QA/QC program consisted of QA/QC samples, quality control (QC) checks, and limits for field procedures.

**QA/QC Samples**. QA/QC samples collected during this investigation included duplicate water samples, replicate soil/sediment samples, trip blanks, ambient condition blanks, and equipment rinsate blanks.

During RI sampling activities at the Point Lonely installation, QA/QC samples collected included the following: 4 duplicate water samples, 11 replicate soil/sediment samples, 4 trip blanks, 2 ambient condition blanks, and 6 equipment rinsate blanks. Table 2-2 summarizes all samples collected and analyzed during RI activities at the Point Lonely installation, including the QA/QC samples.

In addition to the above QA/QC samples, extra volumes of selected samples were collected and submitted for internal laboratory QA/QC (matrix spike and matrix spike duplicates). Extra sample volumes were submitted at a minimum of 1 per 10 samples. Extra volumes submitted included triple volume for organic water analyses and double volume for inorganic water analyses.

**TABLE 2-1. SUMMARY OF POINT LONELY REMEDIAL INVESTIGATION FIELD SAMPLING ACTIVITIES**

| ACTIVITY | TOTAL |
|---|---|
| Water Samples Collected for Lab Analyses (includes QA/QC) | 52 samples |
| Soil/sediment Samples Collected for Lab Analyses (including QA/QC) | 141 samples |
| TOTAL WATER AND SOIL SAMPLES FOR LAB ANALYSES | 193 samples |

(1)

## TABLE 2-2. SUMMARY OF SAMPLING AND ANALYSES CONDUCT

| ANALYSES | HVOC* | BTEX* | VOC 8260 | SVOC | Metals[b] | TPH-Diesel[b] Range 3510/3550 | TPH - R |
|---|---|---|---|---|---|---|---|
| ANALYTICAL METHOD | SW8010M | SW8020 | SW8260 | SW8270 | SW3050 (Soil)<br>3005 (Water)/6010 | Diesel 8100M | Gas 5C |
| **POINT LONELY** | | | | | | | |
| Background | 3 Soil<br>2 Water | 3 Soil<br>2 Water | 3 Soil<br>2 Water | 3 Soil<br>1 Water | 3 Soil<br>2 Water (Total)<br>2 Water (Dissolved) | 4 Soil<br>2 Water | 3<br>2 |
| Sewage Disposal Area (SS01) | NA | 18 Soil<br>4 Water | 3 Soil<br>2 Water | 3 Soil<br>2 Water | NA | 23 Soil<br>5 Water | 1<br>4 |
| Drum Storage Area(ST02) | 8 Soil<br>5 Water | 11 Soil<br>5 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water (Total)<br>1 Water (Dissolved) | 11 Soil<br>5 Water | 1<br>5 |
| Beach Diesel Tanks (SS03) | NA | 7 Soil<br>2 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water | NA | 7 Soil<br>2 Water | 7<br>2 |
| POL Storage (SS04) | NA | 4 Soil<br>1 Water | 1 Soil<br>1 Water | 1 Water | 1 Soil<br>1 Water (Total)<br>1 Water (Dissolved) | 5 Soil | 4<br>1 |
| Diesel Spills (SS05) | NA | 23 Soil<br>7 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water | NA | 33 Soil<br>7 Water | 2<br>7 |
| Old Dump Site (LF07) | 7 Soil<br>2 Water | 7 Soil<br>2 Water | 1 Soil<br>1 Water | 1 Soil | 1 Soil<br>1 Water (Total)<br>1 Water (Dissolved) | 9 Soil<br>2 Water | 2 |
| Garage (SS09) | 9 Soil<br>2 Water | 9 Soil<br>2 Water | 5 Soil<br>2 Water | 2 Soil<br>2 Water | 2 Soil<br>2 Water (Total)<br>2 Water (Dissolved) | 9 Soil<br>2 Water | 2 |
| Diesel Tank (West of Hangar) (ST10) | NA | 8 Soil<br>2 Water | 2 Soil<br>1 Water | 1 Soil<br>1 Water | NA | 12 Soil<br>2 Water | 2 |
| Inactive Landfill (LF11) and Vehicle Storage Area (SS14) | 7 Soil<br>3 Water | 7 Soil<br>3 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water (Total)<br>1 Water (Dissolved) | 7 Soil<br>3 Water | 3 |
| Module Train (SS12) | NA | 4 Soil<br>1 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water | NA | 6 Soil<br>2 Water | 1 |
| Hangar Pad Area (SS13) | NA | 4 Soil<br>3 Water | 1 Soil<br>1 Water | 1 Soil<br>1 Water | NA | 7 Soil<br>3 Water | 3 |
| Total Analyses | 34 Soil<br>14 Water | 105 Soil<br>34 Water | 21 Soil<br>15 Water | 16 Soil<br>13 Water | 9 Soil<br>8 Water (Total)<br>8 Water (Dissolved) | 133 Soil<br>35 Water | 1<br>34 |
| **QA/QC SAMPLES** | | | | | | | |
| Trip Blanks | 3 Water | 4 Water | 4 Water | NA | NA | NA | 4 |
| Equipment Blanks | 6 Water | 6 Water | 6 Water | 4 Water | 4 Water (Total) | 8 Water | 8 |
| Ambient Condition Blanks | 2 Water | 2 Water | NA | NA | NA | NA | 2 |

NA Not analyzed.
* These analyses were completed on a quick turnaround basis.
a The number of soil samples includes sediment samples collected from surface water features.
b Some of these analyses were completed on a 24-hour turnaround at a temporary fixed laboratory at Barrow, Alaska.
d Investigation derived wastes from Point Lonely were combined with the investigation derived wastes from Point Lay, Point Barrow,

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## ·ΞS CONDUCTED FOR POINT LONELY REMEDIAL INVESTIGATIONS[a]

| . esel[b] ɟe ·550 | TPH - Gasoline[b] Range | TPH Residual Range* | PCB* | Pesticides* | TDS | TSS | TOC | TOTAL SAMPLES[d] |
|---|---|---|---|---|---|---|---|---|
| 100M | Gas 5030/8015M | Diesel 8100M | SW8080/8080M | SW8080/8080M | E160.1 | E160.2 | SW9060 | |
| | | | | | | | | |
| ɔil ·ter | 3 Soil 2 Water | 4 Soil 2 Water | 3 Soil 2 Water | 3 Soil 2 Water | 2 Water | 2 Water | 3 Soil 2 Water | 4 Soil 2 Water |
| ·oil ıter | 18 Soil 4 Water | 23 Soil 5 Water | NA | NA | 2 Water | 2 Water | 2 Water | 23 Soil 5 Water |
| ·oil ıter | 11 Soil 5 Water | 11 Soil 5 Water | 8 Soil 5 Water | NA | 1 Water | 1 Water | 1 Water | 11 Soil 5 Water |
| ɔil ıter | 7 Soil 2 Water | 7 Soil 2 Water | NA | NA | 1 Water | 1 Water | 1 Water | 7 Soil 2 Water |
| ɔil | 4 Soil 1 Water | 5 Soil | NA | NA | 1 Water | 1 Water | 1 Soil 1 Water | 5 Soil 1 Water |
| ،oil ater | 26 Soil 7 Water | 30 Soil 7 Water | NA | NA | 1 Water | 1 Water | 1 Soil 1 Water | 30 Soil 7 Water |
| oil ater | 7 Soil 2 Water | 9 Soil 2 Water | 7 Soil 2 Water | NA | 1 Water | 1 Water | 1 Soil 1 Water | 9 Soil 2 Water |
| oil ater | 9 Soil 2 Water | 9 Soil 2 Water | 5 Soil 2 Water | NA | NA | NA | NA | 9 Soil 2 Water |
| ɜoil ater | 8 Soil 2 Water | 12 Soil 2 Water | NA | NA | 1 Water | 1 Water | 1 Water | 12 Soil 2 Water |
| oil ater | 7 Soil 3 Water | 7 Soil 3 Water | 7 Soil 3 Water | 1 Soil | 1 Water | 1 Water | 1 Water | 7 Soil 3 Water |
| oil ater | 4 Soil 1 Water | 6 Soil 2 Water | NA | NA | 1 Water | 1 Water | 1 Water | 6 Soil 2 Water |
| oil ater | 4 Soil 3 Water | 7 Soil 3 Water | NA | NA | 1 Water | 1 Water | 1 Soil 1 Water | 7 Soil 3 Water |
| Soil 'ater | 108 Soil 34 Water | 130 Soil 35 Water | 30 Soil 14 Water | 4 Soil 2 Water | 13 Water | 13 Water | 7 Soil 13 Water | 130 Soil 36 Water |
| | | | | | | | | |
| ٩ | 4 Water | NA | NA | NA | NA | NA | NA | 4 Water |
| ater | 8 Water | 6 Water | 4 Water | 1 Water | NA | NA | 4 Water | 6 Water |
| ٩ | 2 Water | NA | NA | NA | NA | NA | NA | 2 Water |

a.
y, Point Barrow, and Wainwright. These were collectively sampled during the Point Barrow investigation.

(1)

# TABLE 2-2. SUMMARY OF SAMPLING AND ANALYSES CONDUC

| ANALYSES | HVOC* | BTEX* | VOC 8260 | SVOC | Metals[b] | TPH-Diesel[b] Range 3510/3550 | TPH |
|---|---|---|---|---|---|---|---|
| ANALYTICAL METHOD | SW8010M | SW8020 | SW8260 | SW8270 | SW3050 (Soil) 3005 (Water)/6010 | Diesel 8100M | Gas 5 |
| Field Replicates | 4 Soil | 11 Soil | 3 Soil | 2 Soil | 1 Soil | 11 Soil | |
| Field Duplicates | 2 Water | 4 Water | 3 Water | 3 Water | 1 Water (Total)<br>1 Water (Dissolved) | 4 Water | 4 |
| Total Analyses with QA/QC | 38 Soil<br>27 Water | 116 Soil<br>50 Water | 24 Soil<br>28 Water | 18 Soil<br>20 Water | 10 Soil<br>13 Water (Total)<br>9 Water (Dissolved) | 144 Soil<br>47 Water | 1<br>5: |

NA Not analyzed.
* These analyses were completed on a quick turnaround basis.
a The number of soil samples includes sediment samples collected from surface water features.
b Some of these analyses were completed on a 24-hour turnaround at a temporary fixed laboratory at Barrow, Alaska.
d Investigation derived wastes from Point Lonely were combined with the investigation derived wastes from Point Lay, Point Barrow,

(2)

## ʼSES CONDUCTED FOR POINT LONELY REMEDIAL INVESTIGATIONS[a]

| ·l-Diesel[b] Range 10/3550 | TPH - Gasoline[b] Range | TPH Residual Range* | PCB* | Pesticides* | TDS | TSS | TOC | TOTAL SAMPLES[d] |
|---|---|---|---|---|---|---|---|---|
| ;el 8100M | Gas 5030/8015M | Diesel 8100M | SW8080/8080M | SW8080/8080M | E160.1 | E160.2 | SW9060 | |
| '1 Soil<br>Water | 11 Soil<br>4 Water | 11 Soil<br>4 Water | 4 Soil<br>2 Water | NA<br>1 Water | NA<br>3 Water | NA<br>3 Water | 1 Soil<br>3 Water | 11 Soil<br>4 Water |
| 44 Soil<br>ʼ Water | 119 Soil<br>52 Water | 141 Soil<br>45 Water | 34 Soil<br>20 Water | 4 Soil<br>4 Water | 16 Water | 16 Water | 8 Soil<br>20 Water | 141 Soil<br>52 Water |

:ska.

Lay, Point Barrow, and Wainwright. These were collectively sampled during the Point Barrow investigation.

**2.3.2.2 Background Sampling and Analyses**. Six background samples were collected from upgradient areas during field activities at the Point Lonely radar installation to establish background concentrations for naturally occurring organic compounds. In order to obtain a representative range of inorganic (metal) concentrations in soil/sediments and surface waters of the North Slope, 44 samples (29 soil/sediment and 15 water) from seven North Slope radar installations were collected. The seven installations include Barter Island, Bullen Point, Oliktok Point, Point Lonely, Point Barrow, Wainwright, and Point Lay. Approximately five soil/sediment and two surface water background samples were collected from each of these installations to determine the background concentrations of inorganic analytes across similar coastal arctic environments of the North Slope.

Six background samples were collected from tundra and pond areas during the RI at Point Lonely. These consisted of one soil, three sediment, and two surface water samples.

Four background soil/sediment samples were analyzed for DRPH and RRPH. Three samples were also analyzed for GRPH, BTEX, halogenated volatile organic compounds (HVOCs), SVOCs, pesticides, PCBs, total metals, and total organic carbon (TOC).

Two background surface water samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, VOCs, pesticides, PCBs, TOC, total suspended solids (TSS), total dissolved solids (TDS), and total and dissolved metals. One of the water samples was analyzed for SVOCs.

**Data Summary**. Background sample locations at Point Lonely are illustrated in Figure 2-2. The data summary table (Table 2-3) presents analytical results for all background samples collected at Point Lonely. Detection and quantitation limits, action levels, and the associated field and laboratory blank results are included on the data summary table.

Below is a discussion of organic compounds and inorganic analytes detected in background samples at Point Lonely. A discussion of TDS, TSS, and TOC is included. Analytical results are presented in Table 2-3 and Figure 2-2.

**Organics**. No organic compounds were detected in three of the four background soil/sediment samples. Organic compounds were detected in background sediment sample SD01. Compounds and concentrations detected include DRPH at 150 mg/kg, GRPH at 27 mg/kg, and low levels of VOCs that are common components of fuel products. A surface water sample (sample BKGD-SW01) collected from the same location as sediment sample BKGD-SD01 did not contain any of the compounds detected in the sediment sample. Although these compounds were detected in one background sediment sample, the organic concentration in background samples is assumed to be non-detect.

Only one organic compound, 1,2-dichloroethane, was detected in both background surface water samples collected at Point Lonely. The concentrations were 4.9 and 7.9 $\mu$g/L. This compound was detected at similar concentrations in numerous field and laboratory blanks associated with samples collected during the 1993 RI activities and was assumed to be the result of field decontamination procedures. The hexane and methanol used in decontamination procedures may have contained impurities including 1,2-dichloroethane.

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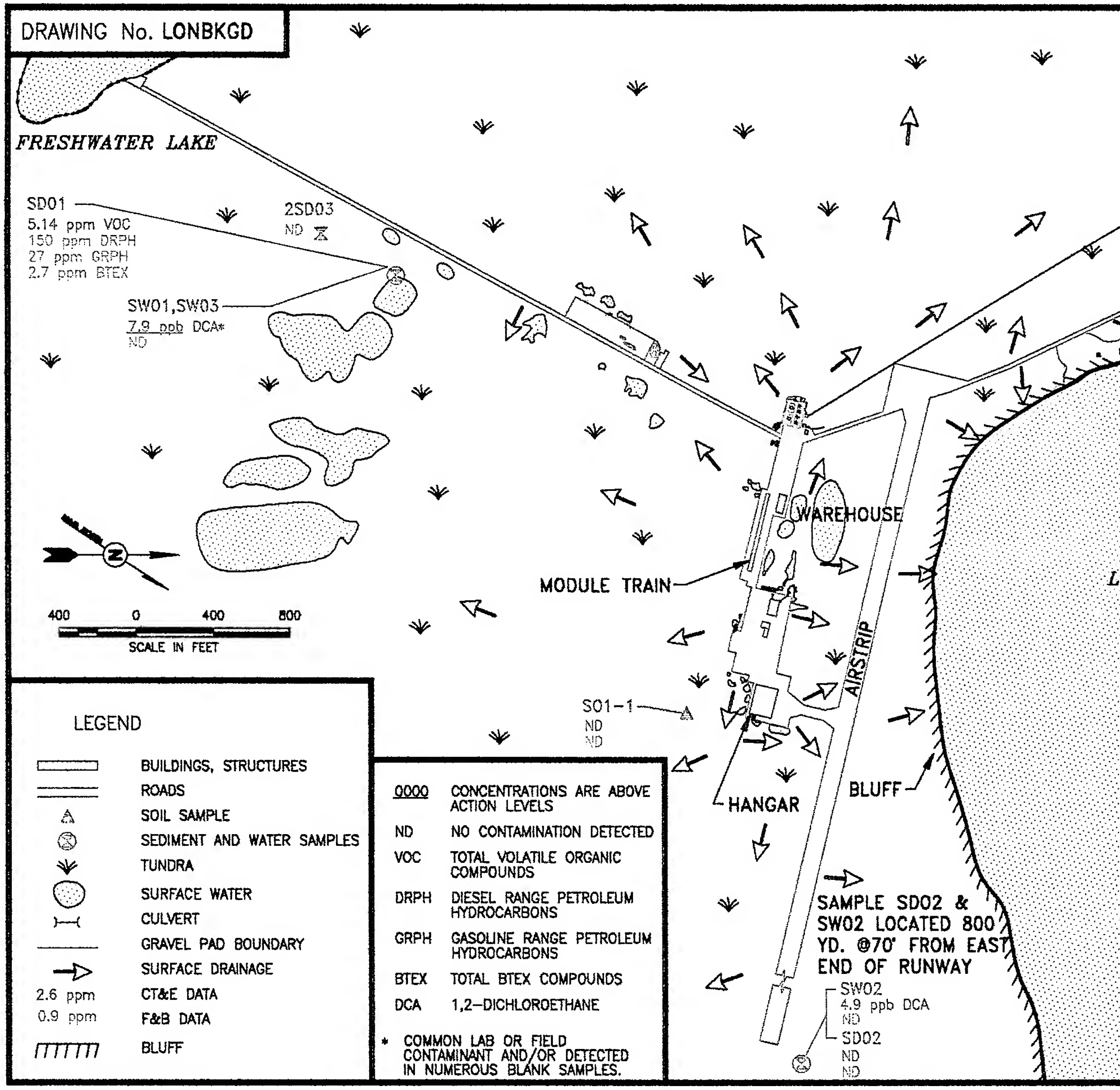


**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 2-2

BACKGROUND SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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The ranges of background concentrations detected for all analytes are presented in data summary tables for each of the Point Lonely sites in Section 3.0 and 4.0.

**Inorganics**. Fifteen metals were detected in background soil and sediment samples and five metals were detected in background surface water samples collected at Point Lonely. The results of inorganic analyses are presented in Table 2-3.

TOC was reported in three soil/sediment samples ranging from 99,600 to 473,000 mg/kg. In the two background surface water samples, TOC was reported at 25,200 and 28,700 μg/L, and TSS were reported at 9,000 and 12,000 μg/L. TDS were reported at 253,600 and 424,000 μg/L in the two background surface water samples.

### 2.3.3 Laboratory Analyses

This section describes the RI analytical program. Summaries of the soil/sediment and water analyses conducted during the RI are presented in Tables 2-4 and 2-5. Table 2-4 presents a description of the soil analytical methods and number of soil samples collected, and Table 2-5 presents a description of the water analytical methods and the number of water samples collected during the RI.

**2.3.3.1 Analytical Program**. Analyses of samples were conducted by a fixed laboratory in Anchorage, Alaska, and a temporary laboratory set up at Barrow, Alaska. The analytical testing conducted by each laboratory is discussed below.

The fixed laboratory in Anchorage, Alaska, was operated by Commercial Testing & Engineering (CT&E). CT&E analyzed samples as follows:

| Analyses | Analytical Method |
|---|---|
| Volatile Organic Compounds | SW5030/8260 |
| Metals | SW3050 (Soil) 3005 (Water)/6010 |
| Semi-Volatile Organic Compounds | SW3550 (Soil) 3510 (Water)/8270 |
| Total Dissolved Solids | E160.1 |
| Total Suspended Solids | E160.5 |
| Total Organic Carbon | SW9060 |
| Moisture Content | ASTM D 2216 |
| Toxicity Characteristic Leaching Procedure (TCLP) | SW1311 |

In addition, for the first few weeks of the field activities, CT&E provided the following analyses on a quick turnaround basis:

| Analyses | Analytical Method |
|---|---|
| Halogenated Volatile Organic Compounds | SW5030/8010 |
| Benzene, Toluene, Ethylbenzene, and Xylenes | SW5030/8020 |
| Gasoline Range Petroleum Hydrocarbons (GRO) | 8015 Modified |
| Diesel Range Petroleum Hydrocarbons (DRO) | 8100 Modified |
| Polychlorinated Biphenyls/Pesticides | SW5030/8080 |

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Background (BKGD)

Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Point Lonely Bkgd. Range | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | SD01 | SD02 | 2SD03 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 699 4506-3 | 734 4504-6 | 700 4506-4 | 1773 | 906 | 694/696 4506-1 | 684 4505-3 | #5-82793 #3&4-82593 4505/4506 | #6-82693 #5-9693 #1&2-82893 4504/4506 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 19-33 | 190-330 | 500[a] | <190[b]-150J[b] | <190[b] | 150J[b] | <330[b] | <300[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 2-3 | 20-30 | 100 | <20J[b]-27J[b] | <20J[b] | 27J[b] | <30J[b] | NA | <100J[b] | <100J[b] | <100J[b] | <50 | <2 |
| RRPH (Approx.) | 18-67 | 180-670 | 2,000[a] | <180-<670 | <380 | <180 | <670 | <800 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <1.0 | 2.7J | <1.5 | NA | | | | | |
| Benzene | 0.004-0.03 | 0.04-0.3 | 0.5 | <0.04-<0.3 | <0.2 | <0.04 | <0.3 | NA | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.004-0.03 | 0.04-0.3 | | <0.2-0.5 | <0.2 | 0.5 | <0.3 | NA | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.004-0.03 | 0.04-0.3 | | <0.2-0.2 | <0.2 | 0.2 | <0.3 | NA | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.008-0.06 | 0.08-0.6 | | <0.4-2.0J | <0.4 | 2.0J | <0.6 | NA | <2 | <2 | <2 | <2 | <0.04 |
| HVOC 8010 | 0.004-0.03 | 0.04-0.3 | | <0.04-<0.3 | <0.2 | <0.04 | <0.3 | NA | <1 | NA | <1 | <1 | <0.02 |
| VOC 8260 | | | | | | | | | | | | | |
| n-Butylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.218 | <0.300 | 0.218 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| sec-Butylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.138 | <0.300 | 0.138 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| Ethylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.362 | <0.300 | 0.362 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| Isopropylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.171 | <0.300 | 0.171 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| p-Isopropyltoluene | 0.020 | 0.050-0.500 | | <0.300-0.107 | <0.300 | 0.107 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| Naphthalene | 0.020 | 0.050-0.500 | | <0.300-0.211 | <0.300 | 0.211 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Background (BKGD)
Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Point Lonely Bkgd. Range | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | SD01 | SD02 | 2SD03 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 699 4506-3 | 734 4504-6 | 700 4506-4 | 1773 | 906 | 694/696 4506-1 | 684 4505-3 | #5-82793 4505/4506 | #6-82693 #5-9693 4504/4506 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| n-Propylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.302 | <0.300 | 0.302 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,2,4-Trimethylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.956 | <0.300 | 0.956 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,3,5-Trimethylbenzene | 0.020 | 0.050-0.500 | | <0.300-0.409 | <0.300 | 0.409 | <0.500 | NA | NA | <1 | <1 | <1 | <0.020 |
| Xylenes (Total) | 0.040 | 0.100-1.00 | | <0.600-2.267 | <0.600 | 2.267 | <1.00 | NA | NA | <2 | <2 | <2 | <0.040 |
| SVOC 8270 | 0.200 | 5.00-30.0 | | <5.00-<30.0 | <20.0 | <5.00 | <30.0 | NA | NA | <10.2 | NA | <10 | <0.200 |
| PCBs | 0.01-0.07 | 0.1-0.7 | 10 | <0.1-<0.7 | <0.4 | <0.1 | <0.7 | NA | NA | <2 | NA | <2 | NA |
| Pesticides | 0.002-0.05 | 0.02-0.5 | | <0.02J-<0.5J | <0.04J-<0.5J | <0.02J-<0.5J | <0.07J-<0.5J | NA | NA | <0.2J-<10J | NA | NA | NA |
| TOC | | | | 99,600-473,000 | 355,000 | 99,600 | 473,000 | NA | NA | <5,000 | NA | <5,000 | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.

## TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Background (BKGD)

Matrix: Soil/Sediment
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Point Lonely Bkgd. Range | Environmental Samples | | | Field Blank | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | S01 | SD01 | SD02 | | EB02 | | |
| Laboratory Sample ID Numbers | | | | | | 4506-3 | 4504-6 | 4506-4 | | 4506-1 | | 4504 4506 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | µg/L | | µg/L |
| Aluminum | 0.35 | 2 | | 1,500-25,000 | 3,600-25,000 | 3,600 | 25,000 | 5,050 | | <100 | | 108 |
| Antimony | N/A | 49-130 | | <7.8-<230 | <49-<130 | <84 | <49 | <130 | | <100 | | <100 |
| Arsenic | 0.11 | 4.9-13 | | <4.9-8.5 | <4.9-<13 | <8.4 | <4.9 | <13 | | <100 | | <100 |
| Barium | 0.024 | 1 | | 27-390 | 165-370 | 165 | 370 | 284 | | <50 | | <50 |
| Beryllium | N/A | 4.2-25 | | <2.6-6.4 | <4.2-<25 | <4.2 | <25 | <6.4 | | <50 | | <50 |
| Cadmium | 0.33 | 4.2J-25 | | <3.0-<36 | <4.2J-<25 | <4.2J | <25 | <6.4J | | <50 | | <50 |
| Calcium | 0.69 | 4 | | 360-59,000 | 4,800-20,300 | 9,900 | 4,800 | 20,300 | | <200 | | <200 |
| Chromium | 0.066 | 1 | | <4.3-47 | 7.5-47 | 7.5 | 47 | 8.5 | | <50 | | <50 |
| Cobalt | N/A | 8.4-13 | | <5.1-12 | <8.4-12 | <8.4 | 12 | <13 | | <100 | | <100 |
| Copper | 0.045 | 1 | | <2.7-45 | 11-45 | 11 | 45 | 24 | | <50 | | <50 |
| Iron | 0.50 | 2 | | 5,400-35,000 | 10,800-31,000 | 10,800 | 31,000 | 14,600 | | <100 | | <100 |
| Lead | 0.13 | 8.4-13 | | <5.1-22 | <8.4-22 | <8.4 | 22 | <13 | | <100 | | <100 |
| Magnesium | 0.96 | 4 | | 360-7,400 | 1,300-7,300 | 1,300 | 7,300 | 3,200 | | <200 | | <200 |
| Manganese | 0.025 | 1 | | 25-290 | 50-210 | 51 | 210 | 50 | | <50 | | <50 |
| Molybdenum | N/A | 4.2-25 | | <2.5-<11 | <4.2-<25 | <4.2 | <25 | <6.4 | | <50 | | <50 |
| Nickel | 0.11 | 1 | | 4.2-46 | 24-46 | 24 | 46 | 30 | | <50 | | <50 |
| Potassium | 23 | 420-640 | | <300-2,200 | <420-1,800 | <420 | 1,800 | <640 | | <5,000 | | <5,000 |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Background (BKGD)

Matrix: Soil/Sediment
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Point Lonely Bkgd. Range | Environmental Samples | | | Field Blank | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | S01 | SD01 | SD02 | | EB02 | | |
| Laboratory Sample ID Numbers | | | | | | 4506-3 | 4504-6 | 4506-4 | | 4506-1 | | 4504<br>4506 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | µg/L | | µg/L |
| Selenium | 1.2 | 49-130 | | <7.8-<170 | <49-<130 | <84 | <49 | <130 | | <100 | | <100 |
| Silver | 0.53 | 25-64 | | <3-<110 | <2.5-<64R | <42R | <25 | <64R | | <50J | | <50 |
| Sodium | 0.55 | 5 | | <160-680 | 370-680 | 410 | 370 | 680 | | <250 | | <250 |
| Thallium | 0.011 | 0.20-0.68 | | <0.2-<1.2 | <0.20-<0.68 | <0.44 | <0.20 | <0.68 | | <5 | | <5 |
| Vanadium | 0.036 | 0.1 | | 6.3-59 | 17-59 | 17 | 59 | 17 | | <50 | | <50 |
| Zinc | 0.16 | 1 | | 9.2-95 | 9.4-95 | 20 | 95 | 9.4 | | <50 | | <50 |

☐ CT&E Data.
J Result is an estimate.
R Result has been rejected.

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely　　Matrix: Surface Water
Site: Background (BKGD)　　Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples: SW01 & SW03 (Duplicates) | | Environmental Samples: SW02 | Field Blanks: AB01 | Field Blanks: EB02 | Field Blanks: TB02 | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | 706<br>707<br>4504-1 | 688<br>690<br>4504-5 | 666<br>672<br>4506-2 | 906 | 694<br>696<br>4506-1 | 684<br>4505-3 | #5-82793<br>#3&4-82593<br>4504<br>4505<br>4506 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | <1,000 | | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | NA | <1,000[b] | NA | <1,000 |
| GRPH | 10 | 100 | | <100J[b] | <100J[b] | <100J[b] | <100J[b] | <100J[b] | <100J[b] | <50[b] | <50 |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| HVOC 8010 | 0.1 | 1 | | <1 | <1 | <1 | <1 | <1 | <1 | NA | <1 |
| VOC 8260 | | | | | | | | | | | |
| 1,2-Dichloroethane | 1 | 1 | 5 | 4.9-7.9 | 7.9 | 5.7 | 4.9 | NA | <1 | <1 | <10 |
| SVOC 8270 | 10 | 10.2-11 | | <10.2-<11 | NA | <11 | <10.2-<10.2J | NA | <10.2 | NA | <10 |
| PCBs | 0.2 | 2 | 0.5 | <2 | <2 | <2 | <2 | NA | <2 | NA | <2 |
| Pesticides | 0.02-1 | 0.2-10 | | <0.2J-<10J | <0.2J-<10J | <0.2J-<10J | <0.2J-<10J | NA | <0.2J-<10J | NA | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Background (BKGD)
Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 & SW03 (Duplicates) | | SW02 | AB01 | EB02 | TB02 | |
| Laboratory Sample ID Numbers | | | | | 706<br>707<br>4504-1 | 688<br>690<br>4504-5 | 666<br>672<br>4506-2 | 906 | 694<br>696<br>4506-1 | 684<br>4505-3 | 4504<br>4505<br>4506 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 28,700 | 26,500 | 25,200 | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | 12,000 | 5,000 | 9,000 | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 424,000 | 422,000 | 253,000 | NA | NA | NA | <10,000 |

☐ CT&E Data.
NA Not analyzed.

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Background (BKGD)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL
(DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Point Lonely Bkgd. Range | Environmental Samples: SW01 & SW03 (Duplicates) | | Environmental Samples: SW02 | Field Blank: EB02 | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | | 4504-1 | 4504-5 | 4506-2 | 4506-1 | 4504 4506 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| Aluminum | 17.4 | 100 | | <100-350 (<100-340) | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 | <100 |
| Antimony | N/A | 100 | 6 | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 | <100 |
| Arsenic | 5.3 | 100 | 50 | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 | <100 |
| Barium | 1.2 | 50 | 2,000 | <50-93 (<50-91) | <50-65 (<50-60) | 65 (60) | 62 (60) | <50 (<50) | <50 | <50 |
| Beryllium | N/A | 50 | 4 | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Cadmium | 1.7 | 50 | 5 | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Calcium | 34.5 | 200 | | 4,500-88,000 (4,100-86,000) | 19,000-35,000 (19,000-34,000) | 35,000 (34,000) | 34,000 (34,000) | 19,000 (19,000) | <200 | <200 |
| Chromium | 3.29 | 50 | 100 | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Cobalt | N/A | 100 | | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 | <100 |
| Copper | 2.3 | 50 | 1,300 | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Iron | 25 | 100 | | 180-2,800 (<100-1,600) | 470-610 (190-330) | 610 (210) | 580 (190) | 470 (330) | <100 | <100 |
| Lead | 6.6 | 100 | 15 | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 | <100 |

☐ CT&E Data.
N/A Not analyzed.

# TABLE 2-3. BACKGROUND ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Background (BKGD)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL (DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Point Lonely Bkgd. Range | Environmental Samples: SW01 & SW03 (Duplicates) | | Environmental Samples: SW02 | Field Blank: EB02 | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | | 4504-1 | 4504-5 | 4506-2 | 4506-1 | 4504 4506 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| Magnesium | 47.8 | 200 | | <5,000-53,000 (2,600-54,000) | 11,000-22,000 (11,000-22,000) | 22,000 (22,000) | 22,000 (21,000) | 11,000 (11,000) | <200 | <200 |
| Manganese | 1.24 | 50 | | <50-510 (<50-120) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Molybdenum | N/A | 50 | | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Nickel | 5.5 | 50 | 100 | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Potassium | 1,154 | 5,000 | | <5,000 (<5,000) | <5,000 (<5,000) | <5,000 (<5,000) | <5,000 (<5,000) | <5,000 (<5,000) | <5,000 | <5,000 |
| Selenium | 62.4 | 100 | 50 | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 (<100) | <100 | <100 |
| Silver | 2.6 | 50 | 50 | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50J (<50R) | <50J | <50J |
| Sodium | 27.7 | 250 | | 8,400-410,000 (8,200-450,000) | 35,000-70,000 (35,000-70,000) | 70,000 (70,000) | 68,000 (68,000) | 35,000 (35,000) | <250 | <250 |
| Thallium | 0.57 | 5 | 2 | <5 (<5) | <5 (<5) | <5 (<5) | <5 (<5) | <5 (<5) | <5 | <5 |
| Vanadium | 1.8 | 50 | | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |
| Zinc | 8.2 | 50 | | <50-160 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 (<50) | <50 | <50 |

☐ CT&E Data.
N/A Not analyzed.

## TABLE 2-4. ANALYTICAL METHODS AND TOTAL NUMBER OF SOIL ANALYSES

| SOIL ANALYSES | ANALYTICAL METHOD | REPORTING UNITS | NUMBER OF ANALYSES | REPLICATES | TOTAL ANALYSES |
|---|---|---|---|---|---|
| Volatile Organics | SW5030/8260 | mg/kg | 21 | 3 | 24 |
| Semi-Volatile Organics | SW3550/8270 | mg/kg | 16 | 2 | 18 |
| Total Metals Analysis --ICP Screen | SW3050/6010 | mg/kg | 9 | 1 | 10 |
| TOC, Soil | SW9060 | mg/kg | 7 | 1 | 8 |
| TPH - Diesel Range | SW3510/3550/8100M | mg/kg | 133 | 11 | 144 |
| TPH - Gasoline Range | SW5030/8015M | mg/kg | 108 | 11 | 119 |
| TPH - Residual Oil | SW3510/3550/8100M | mg/kg | 130 | 11 | 141 |
| BTEX | SW5030/8020/8020M | mg/kg | 105 | 11 | 116 |
| Halogenated Volatile Organic Compounds | SW5030/8010M | mg/kg | 34 | 4 | 38 |
| PCB | SW5030/8080/8080M | mg/kg | 30 | 4 | 34 |
| Pesticides | SW5030/8080/8080M | mg/kg | 4 | 0 | 4 |
| TOTAL SOIL ANALYSES | | | 597 | 59 | 656 |
| TOTAL SOIL SAMPLES | | | 130 | 11 | 141 |

a Includes soil and sediment analyses.
M Modified.

## TABLE 2-5. ANALYTICAL METHODS AND TOTAL NUMBER OF WATER ANALYSES

| WATER ANALYSES | ANALYTICAL METHOD | REPORTING UNITS | NUMBER OF ANALYSES | TRIP BLANKS | AMBIENT CONDITION BLANKS | EQUIPMENT BLANKS | DUPLICATES | TOTAL ANALYSES |
|---|---|---|---|---|---|---|---|---|
| Volatile Organics | SW5030/8260 | µg/L | 15 | 4 | 0 | 6 | 3 | 28 |
| Semi-Volatile Organics | SW3550/8270 | µg/L | 13 | 0 | 0 | 4 | 3 | 20 |
| Total Metals Analysis --ICP Screen | SW3005/6010 | µg/L | 8 | 0 | 0 | 4 | 1 | 13 |
| Dissolved Metals Analysis --ICP Screen | SW3005/6010 | µg/L | 8 | 0 | 0 | 0 | 1 | 9 |
| TOC, Nonpurgable | SW9060 | µg/L | 13 | 0 | 0 | 4 | 3 | 20 |
| Residue, Filterable (TSS) | E 160.2 | µg/L | 13 | 0 | 0 | 0 | 3 | 16 |
| Residue, Filterable (TDS) | E 160.1 | µg/L | 13 | 0 | 0 | 0 | 3 | 16 |
| TPH - Diesel Range | SW3510/3550/8100M | µg/L | 35 | 0 | 0 | 8 | 4 | 47 |
| TPH - Gasoline Range | SW5030/8015M | µg/L | 34 | 4 | 2 | 8 | 4 | 52 |
| TPH - Residual Oil | SW3510/3550/8100M | µg/L | 35 | 0 | 0 | 6 | 4 | 45 |
| BTEX | SW5030/8020/8020M | µg/L | 34 | 4 | 2 | 6 | 4 | 50 |
| Halogenated Volatile Organic Compounds | SW5030/8010M | µg/L | 14 | 3 | 2 | 6 | 2 | 27 |
| PCB | SW5030/8080/8080M | µg/L | 14 | 0 | 0 | 4 | 2 | 20 |
| Pesticides | SW5030/8080/8080M | µg/L | 2 | 0 | 0 | 1 | 1 | 4 |
| TOTAL WATER ANALYSES | | | 251 | 15 | 6 | 57 | 38 | 367 |
| TOTAL WATER SAMPLES | | | 35 | 5 | 2 | 6 | 4 | 52 |

M Modified.

The temporary laboratory in Barrow, Alaska, was operated by Friedman & Bruya (F&B) of Seattle. F&B analyzed samples for the following constituents:

| Analyses | Analytical Method |
|---|---|
| Halogenated Volatile Organic Compounds (four compounds only) | SW5030/8010 Modified |
| Benzene, Toluene, Ethylbenzene, and Xylenes | SW5030/8020 Modified |
| Polychlorinated Biphenyls/Pesticides | SW3550/8080 Modified |
| Diesel Range Organics (DRO) | 8100 Modified |
| Gasoline Range Organics (GRO) | 8010/8020/8015 Modified |
| Residual Range Organics | 8100 Modified |

Analytical methods used during sample analyses for this project are summarized in Tables 2-4 and 2-5 and are developed from the reference methods described in the following sources:

- *Test Methods for Evaluating Solid Waste (Physical/Chemical Methods)* Third Edition, EPA SW-846. September 1986.
- *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020. March 1983.
- *Standard Methods for the Examination of Water and Wastewater*, APHA/AWWA, 17th Edition. 1989.
- *Interim Guidance for Non-UST Soil Cleanup Levels*, Alaska Department of Environmental Conservation, July 1991.

Project-specific analytical methods and procedures, target analytes, quantitation limits, and acceptance criteria are presented in the RI/FS SAP (U.S. Air Force 1993b).

### 2.3.4 Chronology of Laboratory Analyses

Laboratory analyses conducted by the temporary laboratory, F&B, in Barrow, Alaska, were conducted on a quick-turnaround basis. The samples collected at Point Lonely radar installation were analyzed by this laboratory during the period from 25 August to 11 September 1993.

Analyses at the CT&E laboratory in Anchorage, Alaska, were conducted between 26 August and 15 October 1993. These analyses included a few quick-turnaround analyses but primarily standard-turnaround analyses.

### 2.3.5 Laboratory QA/QC Programs

The quality assurance (QA) objectives for this project were achieved through implementation of specific procedures for sampling, chain-of-custody, calibration, laboratory analyses, data validation and reporting, internal QC, audits, preventive maintenance, and corrective actions.

A detailed description of QA/QC measures, frequency, and corrective actions used by both labs is presented in the Quality Assurance Project Plan (QAPjP) [Section 1 of the RI/FS SAP (U.S. Air Force 1993b)]. Ultimately, the relevant laboratory standard operating procedures (SOPs) provide full and detailed guidance regarding all method-specific laboratory QA/QC criteria and appropriate corrective actions.

Data quality for the organic analyses was monitored by the laboratory through a QA program that included analyses of initial and continuing calibrations, method blanks, surrogate spikes, internal standards, matrix spikes, matrix spike duplicates, and laboratory control samples. The identification of target analytes at levels above the detection limit was confirmed by gas chromatography/mass spectrometry (GC/MS) or analysis on a gas chromatograph (GC) equipped with a different column (second column confirmation).

Data quality for the inorganic analyses was monitored through a QC program that included analyses of initial and continuing calibrations, laboratory control samples, method blanks, duplicate samples, post-digestion analytical spikes, and matrix spikes.

Laboratory QC samples were analyzed at a rate of at least one per 20 determinations. See the RI/FS QAPjP for laboratory-specific criteria for the frequency of QC sample analyses and corrective actions regarding QC analyses.

### 2.3.6 Data Validation and Reporting

Data validation is a systematic process of reviewing a group of sample data to provide assurance that the data are adequate for their intended use. The validation activities were performed in accordance with the following EPA documents to the extent that they were applicable:

- *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.* EPA. Hazardous Site Evaluation Division. December 1990.

- *Laboratory Data Validation Guidelines for Evaluating Inorganic Analyses.* EPA. Hazardous Site Evaluation Division. October 1989a.

- *Test Methods for Evaluating Solid Waste (Physical/Chemical Methods)* Third Edition, EPA SW-846. September 1986.

Prior to releasing data for use by project staff, selected data packages underwent a formal validation procedure to examine laboratory compliance with QA requirements and other factors that determine the quality of the data. The organic validation was performed by the prime contractor in accordance with the EPA Functional Guidelines for Evaluating Organic Analyses. The following factors were examined:

- Sample holding times;
- Sample chain-of-custody;
- GC/MS tuning criteria;
- Initial and continuing calibration;

- Method blanks;
- Practical quantitation limits;
- Laboratory blank contamination;
- Surrogate spike recoveries;
- Matrix spike/duplicate analysis;
- Field duplicate analysis;
- Ambient condition blank contamination;
- Trip blank contamination;
- Internal standard area;
- Pesticide instrument performance;
- Compound identification criteria; and
- Analyte identification and quantitation.

The inorganic data validation was performed in accordance with the EPA Functional Guidelines for Evaluating Inorganic Analyses. Parameters evaluated include:

- Holding time;
- Blank results;
- Instrument calibration;
- Inductively coupled plasma (ICP) spectroscopy interference check analysis;
- Laboratory control samples;
- Duplicate analysis;
- Spike analyses;
- Furnace analyses (spikes and duplicates);
- Serial dilution;
- Detection limits; and
- Analyte quantitation.

When a data package was received from the laboratory, the analytical results and associated QA/QC documentation were reviewed for technical compliance, and data validation reports were prepared summarizing the QA/QC parameters that were reviewed. The review included evaluation of laboratory and field blank sample data, and review of all data for accuracy, precision, and completeness.

A cross-section of CT&E analytical data, representing approximately 15 percent of all the CT&E analyses, underwent formal data validation. Because some reporting errors were found in the F&B analytical data, 100 percent of the F&B data was validated. Once the validation for a batch of samples was completed, a validation report was prepared. The report highlights all the QC criteria evaluated, and notes any major deficiencies or QA problems. Although a minimal amount of analytical data was rejected during data evaluation, the acceptable and valid data from CT&E and F&B are sufficient to meet the project objectives. The data validation reports for data generated by CT&E and F&B are presented in Appendix G.

## 2.4 METHODOLOGY FOR RISK ESTIMATION

This section describes the methods used to determine the potential risks to human and ecological receptors from chemicals detected in samples collected from the 12 sites at the installation. A summary of the risks posed by chemicals detected at each of the sites is presented on a site-by-site basis in Sections 3.0 and 4.0. The complete human health and ecological risk assessments are presented in the Point Lonely Risk Assessment (U.S. Air Force 1996), which has been submitted under separate cover.

In addition to the methods for risk evaluation, this section presents contaminant fate and transport, general potential migration pathways, and receptor groups common to all of the Point Lonely sites.

### 2.4.1 Human Health Risk

The evaluation of human health risk is conducted in accordance with standard risk assessment methodology as described in *Risk Assessment Guidance for Superfund (RAGS): Human Health Evaluation Manual, Part A* (EPA 1989b), *Region 10 Supplemental Risk Assessment Guidance for Superfund* (EPA 1991a), and the *Handbook to Support the Installation Restoration Program Statements of Work* (U.S. Air Force 1991). This section presents a summary of the approach used in evaluating the human health risks associated with the sites at the Point Lonely radar installation.

The Point Lonely DEW Line installation presented a unique challenge to the development of a human health risk assessment. Many of the conventional assumptions applied to risk assessments do not apply to the North Slope of Alaska. Point Lonely is remote and sparsely populated. Native residents from surrounding areas, largely Inupiats, follow a lifestyle that includes a significant subsistence component; much of their food consists of mammals (whales, seals, and caribou), aquatic life (arctic char), and birds (ptarmigan and ducks) that are abundant in this area of the arctic. The climate is generally harsh, and the soil and surface water are frozen for approximately nine months of the year. The following paragraphs present some of the approaches and assumptions used in the development of the human health risk assessment.

The general approach to the human health risk assessment was to quantify the excess lifetime cancer risk and the noncancer hazard associated with exposure to the site contaminants detected at each of the twelve sites at the installation. The maximum concentration of each chemical detected was used as the exposure point concentration instead of an arithmetic mean or 95th percentile upper confidence limit (UCL) because contamination was infrequently detected and found to be generally of low concentration. Incorporating nondetects into the calculation of an average or UCL when the frequency of positive detects is low tends to yield low and unreliable estimates of contamination. Use of the maximum concentration yields a more conservative estimate of risk or hazard.

Chemical concentrations detected in soil, sediment, or surface water samples from each of the sites were compared to risk-based screening levels (RBSLs), ARARS, and background concentrations. A chemical was selected as a COC if the maximum concentration at which the

chemical was detected exceeded the corresponding background concentration, and the RBSL (based either on cancer risk or noncancer hazard) or an ARAR. In addition, chemicals detected above background levels were retained as potential COCs if no RBSL or ARAR was available. COCs selected in this manner were evaluated in the human health risk assessment.

An exposure pathway describes the course a chemical will take from a source to an exposure point where a receptor can come into contact with the chemical. The exposure pathways by which exposure to the COCs at Point Lonely may occur include ingestion, dermal contact, and inhalation. The dermal contact and inhalation pathways were not considered complete or significant because the arctic climate precludes dermal contact with and volatilization of site contaminants, so they were not evaluated. Exposure pathways that were considered for all sites were incidental ingestion of soil/sediment and ingestion of surface water.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of a community on the North Slope of Alaska (native), and a child living in a North Slope community (child).

The risk assessment assumed a residential scenario when estimating the soil/sediment and water ingestion rates. The soil/sediment ingestion rate was based on EPA default values, 100 mg/day for adults and 200 mg/day for children. The drinking water ingestion rate assumed a potential future scenario in which the surface water where chemicals were detected at the site will be used as a source of drinking water for 180 days per year at the EPA default ingestion rate of 2 liters per day.

The exposure duration assumed a DEW Line worker would be conducting periodic maintenance at the Point Lonely installation for 10 years. The exposure duration for the native was estimated to be 55 years. EPA's default reasonable maximum exposure duration is 30 years; however, this is based on the residence time in one location for the continental United States. Because Alaskan natives are more likely to remain in North Slope communities for a longer period, 55 years was determined to be a more appropriate estimate of residence time.

The risk assessment was based on the assumptions just described, along with chemical-specific toxicity data, to quantitatively and qualitatively express the hazards and risks. To characterize potential noncancerous effects, comparisons were made between projected intakes of the COCs and chemical-specific toxicity values. The potential noncancerous health effects were expressed as a hazard quotient (HQ). To assess the overall potential for noncancerous effects posed by more than one chemical at a site, the HQs were summed and reported as the hazard index. An HQ or hazard index of 1.0 is the regulatory benchmark. Noncancer hazards greater than 1.0 are generally considered a concern, and noncancer hazards of less than 1.0 are generally considered to not warrant further evaluation (EPA 1991b).

To characterize the potential for carcinogenic effects, the probability that an individual will develop cancer over a lifetime of exposure, the risks were estimated from projected intakes of the COCs and chemical-specific dose-response information. The cancer risks are calculated on a chemical-specific basis and are added together (if more than one chemical associated with cancer risk is a COC at the site) to estimate the total cancer risk for the site. The total cancer

risk for each pathway is generally not considered to be of concern unless it exceeds a value of $1 \times 10^{-6}$ (EPA 1991b).

Excess lifetime cancer risk is the incremental increase over and above the background (i.e., if no exposure to site chemicals occurs) in the probability of developing cancer during one's lifetime. For example, a $1 \times 10^{-6}$ excess lifetime cancer risk means that, in a population of one million people exposed to the carcinogen throughout their lifetimes, the average incidence of cancer may increase by one case. The background probability among Americans of developing cancer at some time in their lives is about one in four (American Cancer Society 1993). The calculation of cancer risks uses information (i.e., cancer slope factors) developed by the EPA that represents upper bound estimates, so any cancer risks estimated in the risk assessment should be regarded as upper bounds on the potential cancer risks rather than accurate representations of true cancer risk. The true cancer risk is likely to be lower than that predicted (EPA 1989a).

Excess lifetime cancer risk and noncancer hazard were calculated for the soil/sediment ingestion and water ingestion pathways. Other pathways were eliminated from consideration as described in the Point Lonely Risk Assessment (U.S. Air Force 1996). The risks and hazards associated with chemicals detected at the Point Lonely sites are presented on a site-by-site basis in Sections 3.0 and 4.0 of this RI/FS report.

### 2.4.2 Ecological Risk

The objective of the environmental risk assessment (ERA) is to estimate potential impacts to aquatic and terrestrial plants and animals at the Point Lonely DEW Line installation. The evaluation of environmental risks was conducted in accordance with current Air Force and EPA guidance, specifically, *Handbook to Support the Installation Restoration Program Statements of Work* (U.S. Air Force 1991), *Framework for Ecological Risk Assessment* (EPA 1992), and *Ecological Risk Assessment Guidance for Superfund* (EPA 1994).

The approach used to assess potential ecological impacts was conceptually similar to that used to assess human health risks. Potentially exposed populations (receptors) were identified, and information on exposure and toxicity was combined to derive estimates of risk. However, the scope of ERAs is generally different from that of human health risk assessments in that ecological assessment focuses on potential impacts to a population of organisms rather than to individual organisms (except in the case of endangered species where individuals are considered). In addition, because ecosystems are composed of a variety of species, ecological assessments evaluate potential impacts to numerous species instead of a single species (as is the case in human health assessments).

Ideally, ERAs should evaluate potential risks to communities and ecosystems, as well as to individual populations. However, because of the large number of species and communities present in natural systems, such ecosystem-wide assessments are very complex and appropriate assessment methodologies have not yet been developed. In addition, dose-response data on community or ecosystem responses are generally lacking. Therefore, evaluations of potential impacts to communities or ecosystems are qualitative.

The degree to which potential ecological impacts can be characterized is highly dependent upon the data available to support such estimates. Data required include: information regarding contaminant release, transport, and fate; characteristics of potential receptor populations; and adequate supporting toxicity data for the COCs. The degree to which the existing database can meet these requirements dictates the extent to which potential ecological impacts can be evaluated.

Ecological receptors can be exposed to COCs through abiotic and biotic media. Potential exposure pathways for terrestrial and aquatic organisms include direct contact and ingestion of contaminated soil/sediment and/or surface water. The most significant route of exposure for plants is direct contact with soil. Aquatic organisms such as fish and invertebrates are primarily exposed through direct contact with surface water, but may be exposed to COCs through ingestion of plant and animal items in the diet, and incidental ingestion of soil/sediment while foraging (although only direct contact with surface water is used to develop risk estimates). Birds and mammals may be exposed to COCs through ingestion of surface water, ingestion of plant and animal diet items, and incidental ingestion of soil/sediment.

The potential ecological receptors evaluated in the risk assessment include plants, aquatic organisms, birds, and mammals likely to occur along the Arctic Coastal Plain. Representative species from these groups of receptors were selected based primarily on the species' likelihood of exposure given their preferred habitat and feeding habits. Species that may be particularly sensitive to environmental impacts, such as endangered or threatened species, were also evaluated. The representative and sensitive species are presented in Tables 2-6 and 2-7. Any threatened or endangered species evaluated in the ERA are not considered representative of the Arctic Coastal Plain or the DEW Line installations. These species are evaluated to provide information about whether they face potential risks from exposure to COCs.

Potential risks to representative species were estimated by evaluating sampling data for the relevant exposure media (i.e., soil/sediment and surface water). Potential risks to plants were evaluated based on a comparison of the average contaminant concentrations in the site soil/sediment via toxicity information in the literature. Potential impacts on aquatic receptors were evaluated by comparing average surface water concentrations to toxicity reference values (TRVs). Potential impacts to birds and mammals were evaluated for selected representative species by comparisons of estimated exposures, based on potential dietary intakes of COCs, to TRVs. TRVs for representative species are derived by selecting toxicity values from the literature and extrapolating to the species of concern. TRVs are then divided into the estimated exposure concentration to derive the HQ. If the HQ is less than one, then adverse effects are not expected. Conversely, if the HQ is equal to or greater than one a potential for adverse effects exists. The confidence level of the risk estimate is increased as the magnitude of the HQ departs from 1.0. For example, there is greater confidence in a risk estimate where the HQ is 0.1 or 10, than in an HQ such as 0.9 to 1.1.

TRVs are calculated to be protective for long-term exposures. This is accomplished by using chronic chemical and receptor-specific no-effect dosages as starting points when such data is available. If chronic or receptor-specific data is not available, then uncertainty and scaling factors (to account for differences in body size) are incorporated in the derivation of the TRVs. This is

## TABLE 2-6. REPRESENTATIVE SPECIES AT THE DEW LINE INSTALLATION SITES

| COMMON NAME | GENUS AND SPECIES |
|---|---|
| Sedge | *Carex* spp. |
| Cottongrass | *Eriophorum* spp. |
| Willow | *Salix* spp. |
| Berries | *Vaccinium* spp. |
| Water fleas | *Daphnia* spp. |
| Nine-spined stickleback | *Pungitius pungitius* |
| Arctic char | *Salvelinus alpinus* |
| Lapland longspur | *Calcarius lapponicus* |
| Brant | *Branta bernicla* |
| Glaucous gull | *Larus hyperboreus* |
| Pectoral sandpiper | *Calidris melanotos* |
| Brown lemming | *Lemmus trimucronatus* |
| Arctic fox | *Alopex lagopus* |
| Barren-ground caribou | *Rangifer tarandus* |

## TABLE 2-7. THREATENED AND ENDANGERED SPECIES CONSIDERED IN THE ECOLOGICAL RISK ASSESSMENT

| COMMON NAME | GENUS AND SPECIES |
|---|---|
| Spectacled eider[a] | *Somateria fischeri* |
| Steller's eider[b] | *Polysticta stelleri* |

a Threatened status.
b Candidate for threatened status.

standard practice in ERAs and is illustrated in screening level benchmarks used in the ERA for sediments (Hull and Suter 1994), aquatic biota (Suter and Mabrey 1994), and wildlife (Opresko et al. 1994). The assumptions incorporated in the ERA assume daily exposure during the receptor's most sensitive life stage (i.e., one breeding season). Consequently, if no risks are identified at the "chronic" level, there will be no risk related to "acute", or occasional exposures. This should be kept in mind when interpreting the HQ. Although the HQ may be greater than one, the conservatism embodied in the TRV and assumptions of the ERA allow for mitigating factors (e.g., large home range, short seasonal exposure, unlikely repeated exposures at a "hot spot" location) that may result in a finding of no significant risk.

The ERA was intended to be at a screening level, rather than a full scale investigation of the state of the ecosystem. No specific onsite studies of the biota were undertaken. The assessment was based on media sampling (i.e., surface water and soil/sediment samples). The ecological risks associated with the chemicals detected at the Point Lonely sites are presented site-by-site in Sections 3.0 and 4.0 of this RI/FS report. The complete ERA is presented in the Section 3.0 of the Final Point Lonely Risk Assessment (U.S. Air Force 1996).

### 2.4.3 Contaminant Fate and Transport

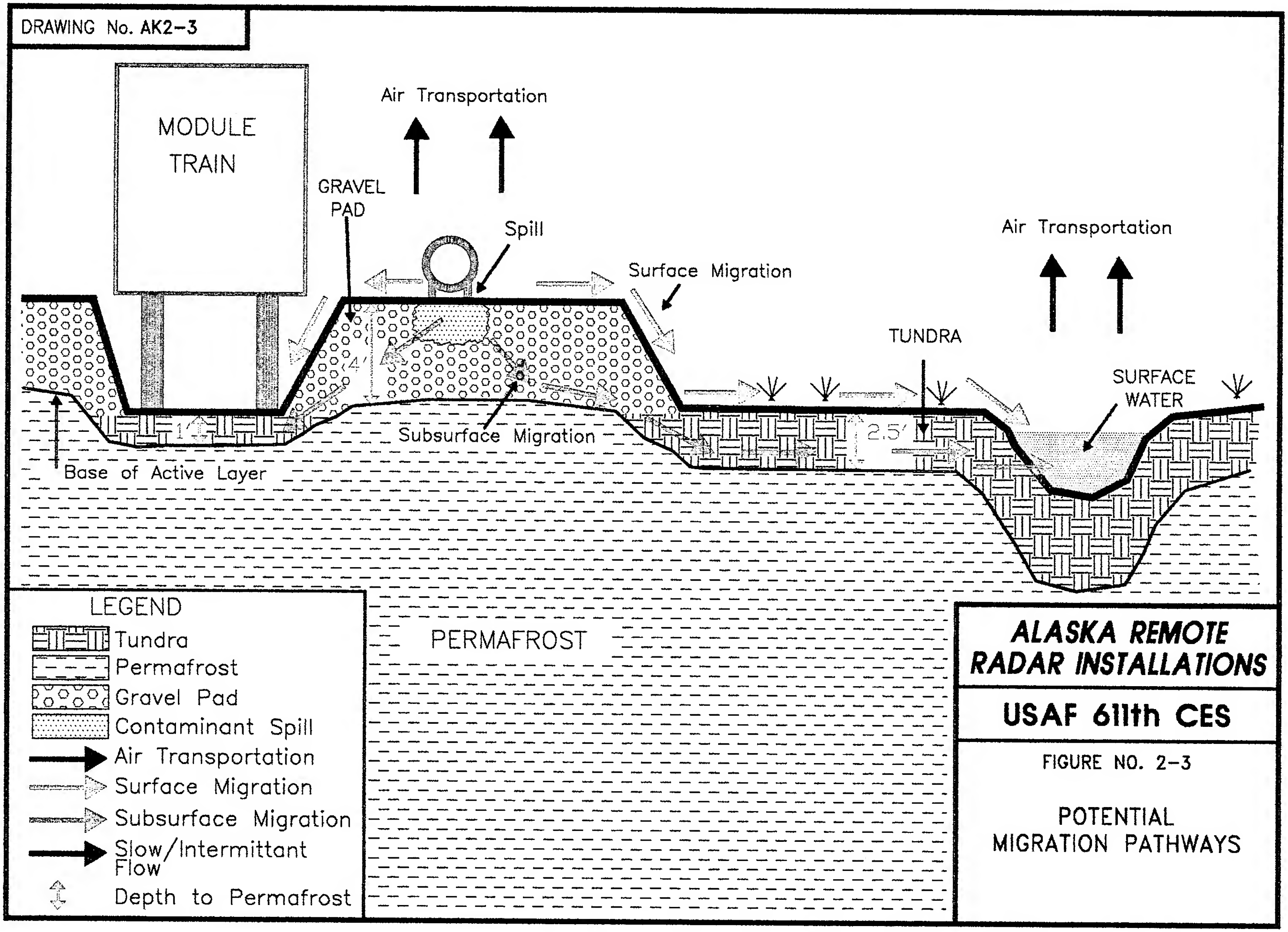
The fate and transport of the COCs in soil/sediment, active layer water, and surface water have been accounted for in the sampling plan. Known source areas were sampled, and the extent of migration was evaluated by sampling at increasing distances from the source area. Surface and subsurface sampling was conducted in gravel pads and tundra areas to characterize the extent of contaminant migration. Water samples were collected in boreholes, streams, and ponds and analyzed to evaluate the migration of contamination from source areas to water bodies potentially used by human or ecological receptors. The potential for contaminant migration is discussed on a site-specific basis in Sections 3.0 and 4.0.

### 2.4.4 General Migration Pathways

This section presents general information concerning migration pathways for the sites at the Point Lonely radar installation. Site-specific migration pathways are discussed in Sections 3.0 and 4.0.

The potential for contaminant migration exists for any site where a release has occurred. The threat that a contaminated site presents to human health or the environment was assessed according to the potential for contaminant migration, human or ecological receptors, and contaminant concentrations to which the receptors may be exposed.

There are three main pathways through which contaminants may reach human and ecological receptors. These pathways are subsurface migration (in affected active layer water), surface migration, and air transportation (as vapors or dust). Potential migration pathways are depicted in Figure 2-3. Figures 2-4 and 2-5 present the potential exposure pathways for the human and ecological receptors, respectively. The discussion of migration pathways is preceded by a general description of the topography and stratigraphy at Point Lonely.



DRAWING No. AK2-3
MODULE TRAIN
Air Transportation
GRAVEL PAD
Spill
Surface Migration
Air Transportation
TUNDRA
SURFACE WATER
4'
1'
2.5'
Subsurface Migration
Base of Active Layer
PERMAFROST
LEGEND
Tundra
Permafrost
Gravel Pad
Contaminant Spill
Air Transportation
Surface Migration
Subsurface Migration
Slow/Intermittant Flow
Depth to Permafrost
ALASKA REMOTE RADAR INSTALLATIONS
USAF 611th CES
FIGURE NO. 2-3
POTENTIAL MIGRATION PATHWAYS

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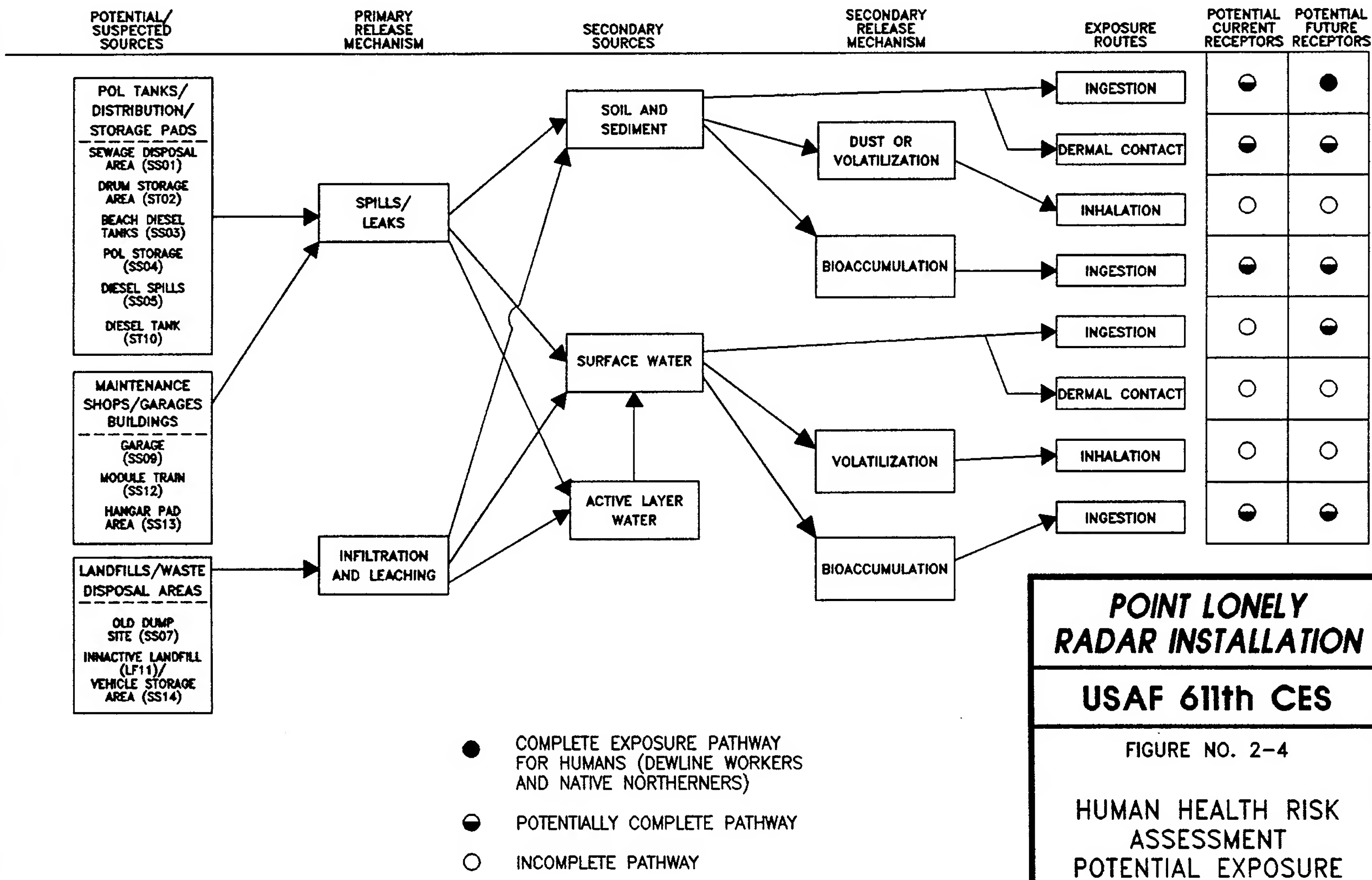
DRAWING No. LON-FLOW




**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 2-4

HUMAN HEALTH RISK ASSESSMENT POTENTIAL EXPOSURE PATHWAYS

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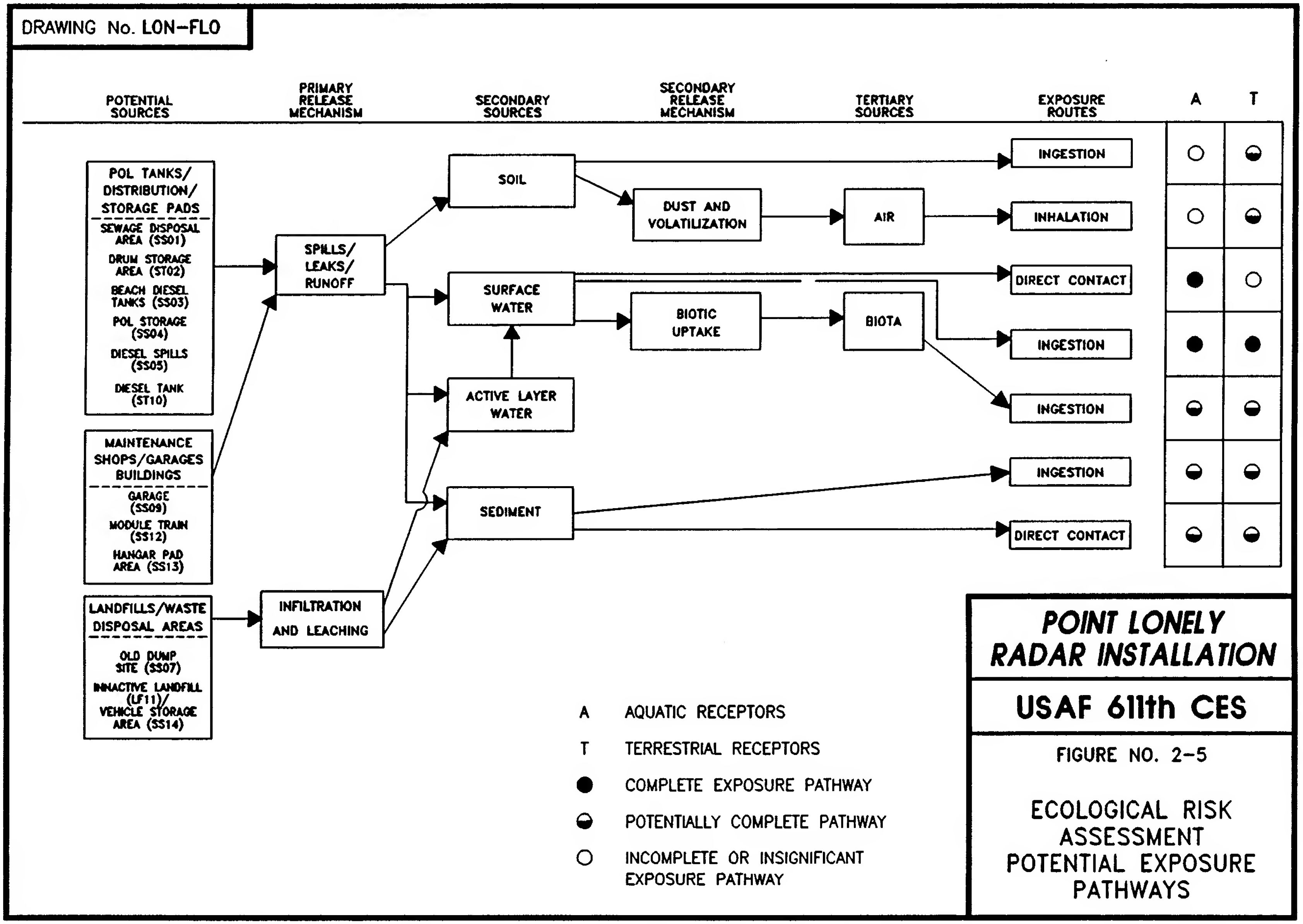
DRAWING No. LON-FLO
POTENTIAL SOURCES
PRIMARY RELEASE MECHANISM
SECONDARY SOURCES
SECONDARY RELEASE MECHANISM
TERTIARY SOURCES
EXPOSURE ROUTES
A
T
POL TANKS/ DISTRIBUTION/ STORAGE PADS
SEWAGE DISPOSAL AREA (SS01)
DRUM STORAGE AREA (ST02)
BEACH DIESEL TANKS (SS03)
POL STORAGE (SS04)
DIESEL SPILLS (SS05)
DIESEL TANK (ST10)
MAINTENANCE SHOPS/GARAGES BUILDINGS
GARAGE (SS09)
MODULE TRAIN (SS12)
HANGAR PAD AREA (SS13)
LANDFILLS/WASTE DISPOSAL AREAS
OLD DUMP SITE (SS07)
INACTIVE LANDFILL (LF11)/ VEHICLE STORAGE AREA (SS14)
SPILLS/ LEAKS/ RUNOFF
INFILTRATION AND LEACHING
SOIL
SURFACE WATER
ACTIVE LAYER WATER
SEDIMENT
DUST AND VOLATILIZATION
BIOTIC UPTAKE
AIR
BIOTA
INGESTION
INHALATION
DIRECT CONTACT
INGESTION
INGESTION
INGESTION
DIRECT CONTACT
A AQUATIC RECEPTORS
T TERRESTRIAL RECEPTORS
COMPLETE EXPOSURE PATHWAY
POTENTIALLY COMPLETE PATHWAY
INCOMPLETE OR INSIGNIFICANT EXPOSURE PATHWAY
POINT LONELY RADAR INSTALLATION
USAF 611th CES
FIGURE NO. 2-5
ECOLOGICAL RISK ASSESSMENT POTENTIAL EXPOSURE PATHWAYS

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**2.4.4.1 Topography**. The Point Lonely installation is located along the coast of the Beaufort Sea. The main structures at the installation are located approximately one-half mile south of the coastline. A large saline lagoon is located just to the north of the installation's buildings and airstrip. Drainage at the installation is poorly developed and consists of small drainage features that connect larger puddles, tundra ponds, and marshy areas. Drainage in the area of the airstrip and road to the coast generally is toward the saline lagoon. Drainage in other areas of the installation generally are radial from the raised gravel pads to the surrounding relatively flat tundra areas.

Little topographic relief is expressed at the Point Lonely installation; the maximum elevation is approximately 24 feet above MSL. The tundra surface is flat or very slightly sloping. Gravel pads, roads, and airstrip, which are of human origin, rise approximately four to five feet above the tundra. The edges of these features are sloped at the angle of repose for unconsolidated sands and gravels. North of the airstrip a bluff drops approximately 20 feet to the shore of the saline lagoon at sea level.

South, east, and west of the main station facilities, the most prominent natural topographic features, visible from the air and ground surface, are ice wedge polygons. These features are formed by cracking of the ground surface during thermal contraction, followed by infiltration of water. The water then freezes and forces the crack wider. Repeated freeze-thaw cycles enlarge these features, which form small troughs and may fill with water. Intersecting troughs form polygonal arrangements that range from a couple of feet to tens of feet across.

Two types of ice wedge polygons exist: low centered and high centered. In low centered polygons, the middle of the polygon is depressed to form a small basin, which may fill with water. A cross-section of one of these basins would reveal an ice-wedge trough on either side of the polygon, berms lining both sides of the troughs, and a basin filling the interior space between the berms. A high centered polygon does not have a depressed center, and consists of intersecting troughs with higher ground in the middle.

Oriented lakes are another prominent tundra feature. These lakes, which form from low centered polygons, are enlarged by the erosional action of wind-induced waves. These lakes are generally not circular but oblong, with the long axis of the lake normal to the prevailing wind direction. They can "migrate" across the tundra at an average rate of three feet per year (Livingstone 1954) and have a stable depth of approximately 10 feet (Hussey and Michaelson 1966).

**2.4.4.2 Stratigraphy**. The stratigraphy at Point Lonely was examined during RI activities down to the level of the permafrost (generally no deeper than two to four feet during August and September 1993). The upper-most features at the site are gravel roads and pads of human origin. These features, which are limited in areal extent, have a maximum height of approximately six feet. They generally consist of well-graded sandy gravels with sub-angular to sub-rounded, very fine to coarse sands and sub-angular to sub-rounded gravel clasts ranging from one-quarter inch to one and one-half inches (although gravel clasts ranging up to four inches or more are occasionally encountered). The grains are unconsolidated, and fine material (silts or clays) may be present in minor quantities.

Gravel pads and roads were constructed on top of native tundra, which occurs throughout the site. The top of the tundra consists of a vegetative mat in a loamy/silty matrix. This mat can reach several inches in thickness. Underlying the tundra mat are fine to coarse sands and gravels, dark brown organic clays, and silt layers. The depth to permafrost beneath the tundra was approximately two feet during the 1993 RI. Adjacent to the saline lagoon and the Beaufort Sea, beaches are present that consist of poor to well sorted sub-rounded to rounded, fine to coarse sands, and sub-rounded to rounded gravel clasts of varying size; minor amounts of fine material are also present.

**2.4.4.3 Subsurface Migration**. Active layer water flow under the tundra is hampered by the presence of numerous wet depressions and the relatively flat topography; because the depth to permafrost under these depressions is increased, they tend to act as small catchment basins. These basins limit the potential for the horizontal flow of active layer water (Miller et al. 1980; Robertson 1988). The active layer water flow in these areas is so inhibited that it can contribute little to the midsummer water budget of tundra streams. Most of the active layer water contribution to these streams is from immediately adjacent well-drained slopes (Robertson 1988).

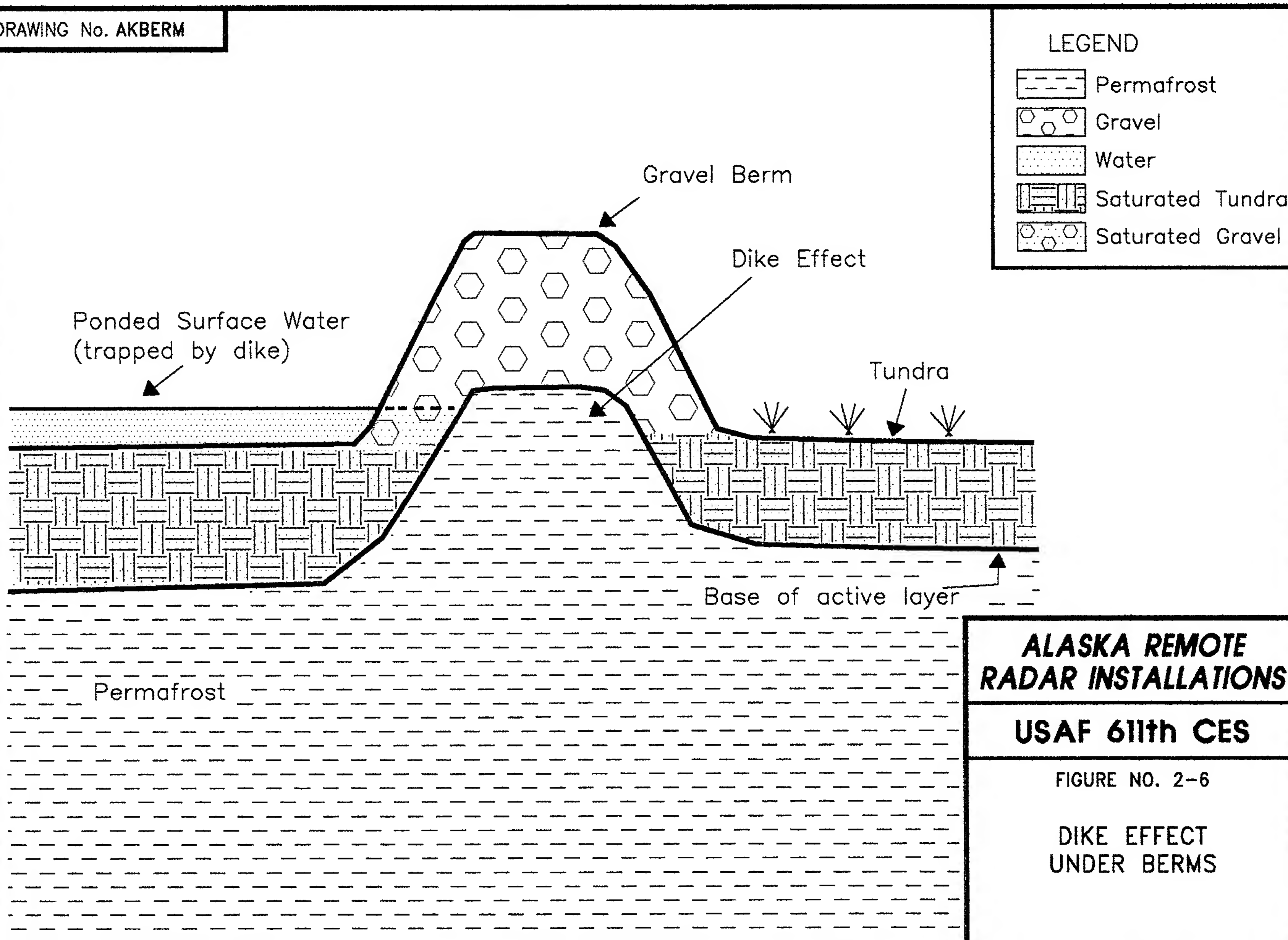
Some generalizations about active layer water flow can be made. Due to the combined effects of low topographic relief and the presence of numerous catchment basins, active layer water migration through areas of tundra is a slow process. The active layer water contribution to tundra streams is mainly from well-drained slopes next to those streams. The active layer water flow that does occur is governed by changes in topographic relief and is limited to spring and summer months, with the active layer functioning as a shallow, unconfined aquifer. The water table in such an aquifer tends to mimic topographic features, and active layer water flow is driven by elevation changes. Figure 2-6 illustrates how the elevation changes of gravel roads and berms can restrict active layer water flow.

**2.4.4.4 Surface Migration**. Surface migration at the Point Lonely installation may occur as a result of the flow of surface water from topographic highs to topographic lows. Surface water flow during the spring thaw, when mounds of snow can channel drainage in unexpected directions, can be markedly different from flow during the summer months. The general surface migration features and directions are depicted in Figure 1-8.

The main factors controlling surface water flow are the topography and water availability. The topography at the Point Lonely installation has very little relief; therefore, there is only a small gradient to drive surface water flow. Combined with the depressions formed by the ice wedge polygons and gravel roads and berms, this creates a multibasinal drainage pattern in which much of the surface water is directed into depressions and small tundra ponds, rather than directly into drainage channels. Gravel pads provide the greatest topographic relief at the installation. Surface migration is generally radial out from the gravel pads.

Based upon precipitation alone, Point Lonely could classify as a desert (Robertson 1988). Precipitation along the Beaufort Sea coast averages only seven inches per year (Dingman et al. 1980; Walker et al. 1980). Additionally, 65 percent of the precipitation on the North Slope is in the form of snow (Walker et al. 1980). Most surface water flow occurs during the spring, when melting snow and ice release stored water over a relatively short time-frame and the active layer

DRAWING No. AKBERM




**ALASKA REMOTE RADAR INSTALLATIONS**

**USAF 611th CES**

FIGURE NO. 2-6

DIKE EFFECT
UNDER BERMS

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remains partially frozen. This creates a situation in which there is a large supply of surface water and very little capacity for infiltration. The result is the overland sheet flow (Robertson 1988), during which drainage is not confined to local drainage features but may travel in a sheet-like fashion over the topography. Snow, ice, and man-made features (gravel pads and roads) may also result in barriers that force the flow of surface water in directions different from those dictated by the underlying ground surface.

There is comparatively little flow of surface water during the summer. In fact, arctic wetlands exist because the lack of significant vertical relief retards the horizontal flow of surface water, and permafrost limits downward flow (Robertson 1988). Overflow from the tundra ponds is generally dependant upon summer rainfall.

The potential for contaminant migration in surface water is, therefore, greatest during the spring thaw, which is of relatively short duration, during which the precise direction of flow may be difficult to determine. There are no distinct streams at the Point Lonely installation.

**2.4.4.5 Air Transport**. Air transportation of contaminants is not considered to be a significant migration pathway at Point Lonely. The frozen conditions encountered most of the year are not conducive to the volatilization of organic contaminants or to the transport of affected dust and dirt. During the summer months, the air and ground temperatures remain relatively low (reducing volatility), and the abundant supply of moisture retards the entrainment of affected dust.

### 2.4.5 Receptors

Three potential human receptor groups were evaluated for the Point Lonely Risk Assessment: an adult assigned to a DEW Line installation (worker), an adult native of the North Slope of Alaska (native), and a native child (child). These receptor groups represent the reasonable maximum exposure at an installation that is in close proximity to a native village and may be released for civilian use at some time in the future.

The primary routes of human exposure evaluated in the Point Lonely Risk Assessment are incidental ingestion of soil/sediment and ingestion of surface water.

For the ecological evaluation it was assumed that terrestrial and aquatic species are potential receptors for at least the six months of the year when the region is not ice and snow covered. In addition, it was assumed that species that occur at great distances from the specific installations are not receptors (e.g., whales). Whales may migrate off-shore from the DEW Line installation; it is unlikely, however, that these mammals are potential receptors to COCs released from the sites because of dilution of surface water entering the Arctic Ocean and the distance off-shore that these animals migrate. Potential ecological receptors evaluated in the ERA were discussed in Section 2.4.2.

The potential human health and ecological risks to receptors associated with the contaminants detected at the Point Lonely sites are reported on a site-specific basis in Sections 3.0 and 4.0.

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# 3.0 REMEDIAL INVESTIGATION - NO FURTHER ACTION SITES

This section of the RI/FS presents results from RI sampling and analysis activities for each of the six Point Lonely sites recommended for no further action. The six sites considered for no further action and discussed in this section are the Old Dump Site (LF07), Diesel Tank (ST10), Inactive Landfill (LF11), Module Train (SS12), Hangar Pad Area (SS13), and Vehicle Storage Area (SS14). The Inactive Landfill (LF11) and Vehicle Storage Area (SS14) were found to be the same site (i.e., the landfill was covered with gravel and then used as a vehicle storage area); therefore the site was investigated and reported in this section as one site referred to as the Inactive Landfill/Vehicle Storage Area.

Each of the no further action sites is presented individually in Sections 3.1 through 3.5. (Note: figures and tables are presented at the end of each section.) The information presented for each site includes site background, field sampling and analytical results, potential migration pathways, human health and ecological risk assessment summaries, and conclusions and recommendations. The site-by-site discussions in this section are intended to provide the reader with all information needed to support no further action at each of the sites.

Photographs of the Point Lonely installation and the sites investigated during the RI are presented in Appendix B. Data tables in this section list analytical results from samples in which chemicals were detected above quantitation limits. Complete laboratory analytical data sheets for each sample, including quantitation limits for non-detected analytes, are presented in Appendix F.

## 3.1 OLD DUMP SITE (LF07)

### 3.1.1 Site Background

This site is an old landfill site used from approximately 1955 to 1976. This inactive landfill is located near the western edge of the lagoon north of the main station facilities and is less than one acre in size. The area has been covered with gravel and graded flat. The lagoon side of the landfill is eroding, and some debris is exposed. No additional information on the types of waste disposed of at the site is available.

Previous sampling, conducted in 1987 by Air Force contractors, detected petroleum hydrocarbons and three metals in soil and one VOC in surface water at the site. A detailed list of concentrations detected previously is presented in the RI/FS Work Plan (U.S. Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 3.1.3.

### 3.1.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Old Dump Site (LF07). The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**3.1.2.1 Summary of Samples Collected**. A total of 11 samples was collected from tundra, gravel cap, ponds, and streams at the site. These consisted of nine soil and two surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Old Dump Site (LF07) are presented in Figure 3-1.

The nine soil samples were analyzed for DRPH and RRPH. In addition, seven were analyzed for GRPH, BTEX, HVOCs, and PCBs. One was analyzed for VOCs, SVOCs, total metals, and total organic carbon (TOC).

The two surface water samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, and PCBs. In addition, one water sample was analyzed for VOCs, TOC, total suspected solids (TSS), TDS, and total and dissolved metals.

**3.1.2.2 Analytical Results**. The data summary table (Table 3-1) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds and inorganic analytes with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 3-1. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. Only metals detected above background levels that exceed an RBSL or ARAR are presented on Figure 3-1. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds and inorganic analytes detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil samples collected at the site are limited to DRPH and RRPH. DRPH were detected in two soil/sediment samples at 80 and 270 mg/kg (samples LF04-S04 and LF04-S06, respectively). RRPH were detected in three soil samples at concentrations ranging from 120 to 5,900 mg/kg.

In surface water samples, no organic compounds were detected.

**Inorganics**. In soils, metals analyses indicated that one metal (magnesium) was detected above background concentrations. Magnesium was detected at 30,000 mg/kg in soil sample LF07-S03.

In the surface water sample, two metals (barium and iron) were detected above background concentrations. Barium and iron were detected at 170 and 11,000 μg/L, respectively, in surface

water sample LF07-SW02. TOC was reported at 9,040 mg/kg in soil sample LF07-S03. TOC, TSS, and TDS were reported at 32,600, 4,500, and 972,000 µg/L, respectively, in surface water sample LF07-SW02.

**3.1.2.3 Summary of Site Contamination**. Previous sampling conducted at the Old Dump Site (LF07) detected petroleum hydrocarbons (TPH) and three metals at low levels in landfill soil. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

During previous sampling, conducted in 1987 and 1989, petroleum hydrocarbons (TPH) were detected in two soil samples at 77 and 11,000 mg/kg, and three metals (arsenic, barium, and lead) were detected in one soil sample at low levels (11, 34, and 5.2 mg/kg, respectively). One VOC (trichlorofluoromethane) was detected in a previous surface water sample at 0.73 µg/L.

A comparison of historical and current project data indicates that there is a lower concentration of petroleum hydrocarbons and other organic compounds than there has been in the past. Organic compounds detected during the 1993 RI include DRPH (270 mg/kg) and RRPH (5,900 mg/kg) in soil from the site. The highest concentration of DRPH and RRPH were detected in samples collected from two stained areas on the gravel cap of the landfill. A comparison of previously detected metals to current site background metal concentrations indicates that the metals previously detected were not detected at levels of concern during the 1993 RI sampling.

The primary contaminants at the site are petroleum hydrocarbons (DRPH and RRPH). The human health and ecological risks associated with the chemicals detected at the site are presented in Sections 3.1.4 and 3.1.5. The suspected source of petroleum compounds detected during sampling conducted at the Old Dump Site is spills/leaks of oil on the gravel surface of the landfill and/or previous waste disposal practices. The landfill has been inactive since 1976.

### 3.1.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**3.1.3.1 Topography and Stratigraphy**. The site consists of a well-graded gravel cap placed on tundra that slopes gently to the east. The east sloping gradient of the tundra increases slightly on the south side of the site. The greatest relief is provided by the gravel cap adjacent to the lagoon on the east side of the landfill. A beach bluff, which rises approximately 15 feet, exists where the gravel cap meets the beach.

Drainage at the site the generally sluggish to the east. Numerous ponds and intermittent streams are present in the tundra adjacent to the landfill. One distinct small stream runs along the south side of the landfill into the lagoon.

The active layer at this site was approximately two feet thick in tundra areas and four feet thick under gravel pads and roads during the 1993 RI. Gravel pad material consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy found at Point Lonely (Section 2.4.4.2).

#### 3.1.3.2 Migration Potential.

**Subsurface Migration**. Drainage at the site is generally to the east, indicating that subsurface water flow should also be to the east towards the lagoon. The topographic relief indicates that the hydraulic gradient should be to the east and the flow velocities relatively low. The major surface water bodies are a small drainage channel that extends along the south end of the landfill, and the lagoon on the east side of the landfill.

Analytical data indicate that contaminant migration is limited. No contaminants were detected in the downgradient subsurface soil sample collected from the site. In soil samples collected at the east perimeter of the landfill, only relatively low levels of petroleum compounds (DRPH and RRPH) were detected in one small stained area.

**Surface Migration**. Surface migration at the site is to the east towards the lagoon. Surface water samples collected from water bodies in the vicinity of the Old Dump Site indicate that contaminants are not migrating in the surface water from the site. The potential for contaminant migration from the site is low.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Surface and subsurface drainage from the site is generally east towards the adjacent lagoon. Analytical data indicate that although low levels of petroleum hydrocarbons were detected at the site they are limited in extent and do not appear to be migrating offsite. The potential for surface and subsurface migration from the site is limited.

#### 3.1.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the Old Dump Site (LF07) site include Air Force contractor personnel occasionally working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with, and incidental ingestion of, soil/sediment and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers occasionally conducting maintenance at the installation, and native adults and children who may

visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with site chemicals at Point Lonely are presented in Section 3.1.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be affected by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals at detected at the site are presented in Section 3.1.5.

### 3.1.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Old Dump Site (LF07). The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the chemicals detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to RBSLs and ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**3.1.4.1 Chemicals of Concern**. RRPH were identified as a COC for the soil matrix at the Old Dump Site. The maximum concentration of RRPH exceeded the background and ARAR concentrations for petroleum hydrocarbon contamination of soil.

No COC was identified for the surface water at the Old Dump site based on a comparison of the maximum concentrations of detected chemicals with their background, RBSL, and ARAR concentrations.

Table 3-2, Identification of COCs at the Old Dump Site, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and the COCs selected in the risk evaluation.

**3.1.4.2 Exposure Pathways and Potential Receptors.** Because no COC was identified in the surface water matrix at the site, only ingestion of soil/sediment was evaluated in the human health risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**3.1.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** The noncancer hazard associated with the ingestion of soil at the Old Dump Site by a hypothetical native northern adult/child is 0.09, and by a DEW Line worker is 0.002, based on the maximum concentrations of the COCs. The presence of RRPH accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

No COCs were identified for the soils or sediments at the site based on excess lifetime cancer risk. This does not indicate that exposure to the soil or sediment is without cancer risk, but rather that cancer risks, if any, cannot be quantified.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** No COCs were identified for the surface water at the Old Dump Site. The concentrations detected in surface water were below concentrations considered acceptable under Region 10 guidance (EPA 1991a) and ARARs.

**3.1.4.4 Summary of Human Health Risk Assessment.** The potential risks and hazards at the Old Dump Site are limited to the very low noncancer hazards (hazard indices of 0.09 and 0.002) associated with the soil/sediment. In addition, these risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a potential future residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one.

In conclusion, under current uses the COCs identified soil/sediment and surface water at the Old Dump Site pose only minimal, if any, potential threat to human health. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 3.1.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**3.1.5.1 Chemicals of Concern.** COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered to be potentially usable

habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. Iron was identified as a COC in surface water. The only COC in soils at the Old Dump Site was RRPH. None of the identified COCs were associated with significant ecological risk estimates at the Old Dump Site.

**3.1.5.2 Summary of Ecological Risk Assessment.** Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Old Dump Site are minimal.

### 3.1.6 Conclusions and Recommendations

Sampling and analyses have determined that there is no significant contamination at the Old Dump Site (LF07). Only relatively low levels of contaminants were detected. Their source is suspected to be spills/leaks of oil on the gravel surface of the landfill and/or previous waste disposal at the Old Dump Site, which is no longer active.

There does not appear to be any significant migration of contaminants from the site based on the surface water and sediment samples collected in drainage pathways leading from the site.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. Even using the conservative future scenario, the potential human health risks at the site are not of a magnitude that normally requires remedial action. Based on the RI sampling and analyses, risk assessment, and current or future site uses, remedial actions are not warranted at the site. No significant human health or ecological risks were identified at the site. Therefore, the Old Dump Site is recommended for no further action.

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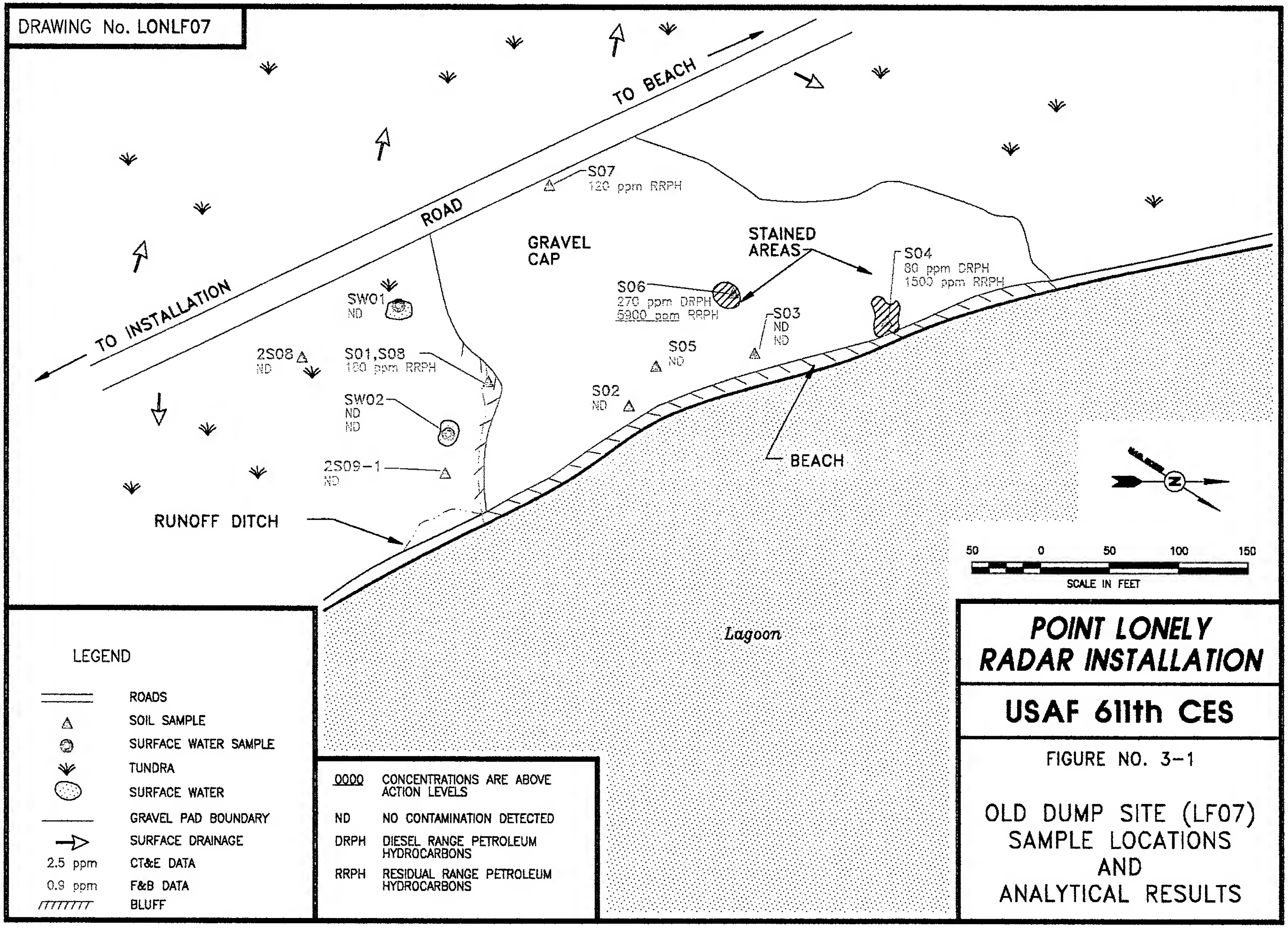

DRAWING No. LONLF07
TO INSTALLATION
ROAD
TO BEACH
S07
120 ppm RRPH
GRAVEL CAP
STAINED AREAS
S04
80 ppm DRPH
1500 ppm RRPH
S06
270 ppm DRPH
5900 ppm RRPH
S03
ND
ND
S05
ND
S02
ND
SW01
ND
2S08
ND
S01,S08
180 ppm RRPH
SW02
ND
ND
2S09-1
ND
RUNOFF DITCH
BEACH
Lagoon
50
0
50
100
150
SCALE IN FEET
LEGEND
ROADS
SOIL SAMPLE
SURFACE WATER SAMPLE
TUNDRA
SURFACE WATER
GRAVEL PAD BOUNDARY
SURFACE DRAINAGE
2.5 ppm
CT&E DATA
0.9 ppm
F&B DATA
BLUFF
0000
CONCENTRATIONS ARE ABOVE ACTION LEVELS
ND
NO CONTAMINATION DETECTED
DRPH
DIESEL RANGE PETROLEUM HYDROCARBONS
RRPH
RESIDUAL RANGE PETROLEUM HYDROCARBONS
POINT LONELY RADAR INSTALLATION
USAF 611th CES
FIGURE NO. 3-1
OLD DUMP SITE (LF07) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Old Dump Site (LF07)
Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 & S08 (Relicates) | | S02 | S03 | S04 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 992 | 994 | 914 | 966 4425-7 | 968 | 1094 | 942/944 4425-9 | 916 4425-8 | #5-83093 #5-82893 #1&2-82893 4425 | #6-82893 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-6 | 50-60 | 500[a] | <190[b]-150J[b] | <50[b] | <50[b] | <60[b] | <50[b] | 80J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-0.3 | 2-3 | 100 | <20J[b]-27J[b] | <2J[b] | <2J[b] | <3J[b] | <2J[b] | <2J[b] | <50J[b] | <100J[b] | <100J[b] | NA | NA |
| RRPH (Approx.) | 10-12 | 100-120 | 2,000[a] | <180-<670 | 180 | <100 | <120 | <100 | 1,500 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <0.10 | <0.10 | <0.16 | <0.10 | <0.10 | | | | | |
| Benzene | 0.002-0.003 | 0.02-0.03 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.03 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | NA |
| Toluene | 0.002-0.003 | 0.02-0.03 | | <0.2-0.5 | <0.02 | <0.02 | <0.03 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | NA |
| Ethylbenzene | 0.002-0.005 | 0.02-0.05 | | <0.2-0.2 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | NA |
| Xylenes (Total) | 0.004-0.005 | 0.04-0.05 | | <0.4-2.0J | <0.04 | <0.04 | <0.05 | <0.04 | <0.04 | <2 | <2 | <2 | <2 | NA |
| HVOC 8010 | 0.002 | 0.02 | | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | NA | NA |
| VOC 8260 | 0.020 | 0.020 | | <0.300-<0.500 | NA | NA | NA | <0.020J | NA | NA | <1-1.3 | <1 | <1 | <0.020 |
| SVOC 8270 | 0.200 | 0.200-0.866 | | <5.00-<30.0 | NA | NA | NA | <0.200-0.866U | NA | NA | <12 | NA | <10 | <0.200 |
| PCBs | 0.01 | 0.1 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | NA | <2 | NA | <2 | <0.1 |
| TOC | | | | 99,600-473,000 | NA | NA | NA | 9,040 | NA | NA | <5,000 | NA | <5,000 | NA |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Old Dump Site (LF07)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S05 | S06 | S07 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 910 | 912 | 996 | 944 | 942/944 | 916 | #5-83093<br>#5-82893<br>#1&2-82893 | #6-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-6 | 50-60 | 500[a] | <180[b]-150J[b] | <50[b] | 270J[b] | <60[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | <2J[b] | <2J[b] | <2J[b] | <50J[b] | <100J[b] | <100J[b] | NA | NA |
| RRPH (Approx.) | 10 | 100 | 2,000[a] | <180-<670 | <100 | 5,900 | 120 | NA | <2000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | <0.10 | <0.10 | | | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | NA |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | NA |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | NA |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | <0.04 | <0.04 | <0.04 | <2 | <2 | <2 | <2 | NA |
| HVOC 8010 | 0.002 | 0.02 | | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | NA | NA |
| PCBs | 0.01 | 0.1 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.1 | NA | <2 | NA | <2 | <0.1 |

▒ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Old Dump Site (LF07)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2S08 | 2S09-1 | | | EB08 | | |
| Laboratory Sample ID Numbers | | | | | 1778 | 1779 | | | 1774 | #6-9993 | #5-9693 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L | mg/kg |
| DRPH | 7-30 | 70-300 | 500[a] | <190[b]-150J[b] | <300[b] | <70[b] | | | 289J[cd] | <1,000 | <50 |
| RRPH (Approx.) | 14-60 | 140-600 | 2,000[a] | <180-<670 | <600 | <140 | | | <2,000 | <2,000 | <100 |

- ☐ CT&E Data.
- ▩ F&B Data.
- NA Not analyzed.
- J Result is an estimate.
- a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
- b DRPH concentrations reported for these samples are equivalent to diesel range organics (DRO) as defined by ADEC.
- c This sample was analyzed by F&B also; DRPH were detected at <1,000[b] µg/L.
- d The laboratory reported that the EPH pattern in this sample was not consistent with a middle distillate fuel.

# TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Old Dump Site (LF07)

Matrix: Soil
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | S03 | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4425-7 | | | 4425-9 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L |
| Aluminum | 0.35 | 1,600 | | 1,500-25,000 | <1,600 | | | <100 | <100 |
| Antimony | N/A | 48 | | <7.8-<230 | <48 | | | <100 | <100 |
| Arsenic | 0.11 | 48 | | <4.9-8.5 | <48 | | | <100 | <100 |
| Barium | 0.024 | 1 | | 27-390 | 65 | | | <50 | <50 |
| Beryllium | N/A | 2.4 | | <2.6-6.4 | <2.4 | | | <50 | <50 |
| Cadmium | 0.33 | 2.4 | | <3.0-<36 | <2.4 | | | <50 | <50 |
| Calcium | 0.69 | 4 | | 360-59,000 | 53,000J | | | 250 | <200 |
| Chromium | 0.066 | 2.4 | | <4.3-47 | <2.4 | | | <50 | <50 |
| Cobalt | N/A | 4.8 | | <5.1-12 | <4.8 | | | <100 | <100 |
| Copper | 0.045 | 24 | | <2.7-45 | <24 | | | <50 | <50 |
| Iron | 0.50 | 2 | | 5,400-35,000 | 8,200 | | | <100 | <100 |
| Lead | 0.13 | 48 | | <5.1-22 | <48 | | | <100 | <100 |
| Magnesium | 0.96 | 4 | | 360-7,400 | 30,000J | | | <200 | <200 |
| Manganese | 0.025 | 1 | | 25-290 | 110 | | | <50 | <50 |
| Molybdenum | N/A | 2.4 | | <2.5-<11 | <2.4 | | | <50 | <50 |
| Nickel | 0.11 | 1 | | 4.2-46 | 3.7 | | | <50 | <50 |
| Potassium | 23 | 100 | | <300-2,200 | 370 | | | <5,000 | <5,000 |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

# TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

| Installation: Point Lonely<br>Site: Old Dump Site (LF07) | Matrix: Soil<br>Units: mg/kg | | | METALS ANALYSES | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | Field Blank | Lab Blank |
| | | | | | S03 | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4425-7 | | | 4425-9 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L |
| Selenium | 1.2 | 48 | | <7.8-<170 | <48 | | | <100 | <100 |
| Silver | 0.53 | 24 | | <3-<110 | <24R | | | <50 | <50 |
| Sodium | 0.55 | 5 | | <160-680 | 120 | | | 420 | <250 |
| Thallium | 0.011 | 0.26 | | <0.2-<1.2 | <0.26 | | | <5 | <5 |
| Vanadium | 0.036 | 1 | | 6.3-59 | 15 | | | <50 | <50 |
| Zinc | 0.16 | 1 | | 9.2-95 | 7.5 | | | <50 | <50 |

☐ CT&E Data.
R Result has been rejected.

## TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Old Dump Site (LF07)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | Field Blanks | | | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | AB02 | EB03 | EB04 | TB03 | TB04 | |
| Laboratory Sample ID Numbers | | | | | 1090 1088 | 990 988 4428-2 | 1094 | 942/944 4425-9 | 1098 1100 4426-4 | 916 4425-8 | 1092 4426-3 | #5-83093 #5-82893 #1&2-82893 4425/4426 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000J[b] | <1,000[b] | NA | <1,000[b] | <1,000J[b] | NA | NA | <1,000 |
| GRPH | 5-10 | 50-100 | | <100J[b] | <50J[b] | <100J[b] | <50J[b] | <100J[b] | <50J[b] | <100J[b] | <50J[b] | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | NA | <2,000 | <2,000 | NA | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | <1 | <1 | <2J | <1 | <6J | <1 |
| Toluene | 0.1-0.2 | 1-2 | 1,000 | <1 | <2J | <1 | <1 | <1 | <2J | <1 | <4J | <1 |
| Ethylbenzene | 0.1-1 | 1-10 | 700 | <1 | <10J | <1 | <1 | <1 | <2J | <1 | <3J | <1 |
| Xylenes (Total) | 0.2-1.2 | 2-12 | 10,000 | <2 | <12J | <2 | <1 | <2 | <2J | <2 | <3J | <2 |
| HVOC 8010 | 0.1 | 1 | | <1 | <1 | <1 | NA | <1 | <1 | <1 | <1 | NA |
| VOC 8260 | 1 | 1 | | <1-7.9 | NA | <1 | NA | <1-1.3 | <1 | <1 | <1 | <1 |
| PCBs | 0.2 | 2 | 0.5 | <2 | <2J | <2 | NA | <2 | <2 | NA | NA | <2 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | NA | 32,600 | NA | <5,000 | <5,000 | NA | NA | <5,000 |
| TSS | 100 | 100 | | 5,000-12,000 | NA | 4,500 | NA | NA | NA | NA | NA | <100 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | NA | 972,000 | NA | NA | NA | NA | NA | <10,000 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

| Installation: Point Lonely<br>Site: Old Dump Site (LF07) | Matrix: Surface Water<br>Units: µg/L | | METALS ANALYSES: TOTAL<br>(DISSOLVED) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
| | | | | | SW02 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4428-2 | | | | | 4425-9 | 4425<br>4428 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Aluminum | 17.4 | 100 | | <100-350<br>(<100-340) | <430<br>(<100) | | | | | <100 | <100 |
| Antimony | N/A | 100 | 6 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Arsenic | 5.3 | 100 | 5 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Barium | 1.2 | 50 | 2,000 | <50-93<br>(<50-91) | 170<br>(120) | | | | | <50 | <50 |
| Beryllium | N/A | 50 | 4 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Cadmium | 1.7 | 50 | 5 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Calcium | 34.5 | 200 | | 4,500-88,000<br>(4,100-86,000) | 80,000<br>(78,000) | | | | | 250 | 250 |
| Chromium | 3.29 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Cobalt | N/A | 100 | | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Copper | 2.3 | 50 | 1,300 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Iron | 25 | 1000 | | 180-2,800<br>(<100-1,600) | 11,000<br>(<100) | | | | | <100 | <100 |
| Lead | 6.6 | 100 | | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |

☐ CT&E Data.
N/A Not available.

# TABLE 3-1. OLD DUMP SITE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Old Dump Site (LF07)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL (DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW02 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4428-2 | | | | | 4425-9 | 4425<br>4428 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Magnesium | 47.8 | 200 | | <5,000-53,000<br>(2,600-54,000) | 44,000<br>(42,000)J | | | | | <200 | <200 |
| Manganese | 1.24 | 50 | | <50-510<br>(<50-120) | 270<br>(69) | | | | | <50 | <50 |
| Molybdenum | N/A | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Nickel | 5.5 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Potassium | 1,154 | 5,000 | | <5,000<br>(<5,000) | <5,000<br>(<5,000) | | | | | <5,000 | <5,000 |
| Selenium | 62.4 | 100 | 50 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Silver | 2.6 | 50 | 50 | <50<br>(<50) | <50J<br>(<50) | | | | | <50 | <50 |
| Sodium | 27.7 | 250 | | 8,400-410,000<br>(8,200-450,000) | 130,000J<br>(120,000) | | | | | 420 | 420 |
| Thallium | 0.57 | 5 | 2 | <5<br>(<5) | <5<br>(<5) | | | | | <5 | <5 |
| Vanadium | 1.8 | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Zinc | 8.2 | 50 | | <50-160<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

# TABLE 3-2. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE OLD DUMP SITE (LF07)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Old Dump Site (LF07) | Soil | DRPH | 270J | mg/kg | <190-150J | -- | -- | 500[c] | No |
| | | RRPH | 5,900 | mg/kg | <180-<670 | -- | -- | 2,000[c] | **Yes** |
| | | Barium | 65 | mg/kg | 27-390 | -- | 1,890 | -- | No |
| | | Calcium | 53,000J | mg/kg | 360-59,000 | -- | -- | -- | No |
| | | Iron | 8,200 | mg/kg | 5,400-35,000 | -- | -- | -- | No |
| | | Magnesium | 30,000J | mg/kg | 360-7,400 | -- | -- | -- | No |
| | | Manganese | 110 | mg/kg | 25-290 | -- | 3,780 | -- | No |
| | | Nickel | 3.7 | mg/kg | 4.2-46 | -- | 540 | -- | No |
| | | Potassium | 370 | mg/kg | <300-2,200 | -- | -- | -- | No |
| | | Sodium | 120 | mg/kg | <160-680 | -- | -- | -- | No |
| | | Vanadium | 15 | mg/kg | 6.3-59 | -- | 189 | -- | No |
| | | Zinc | 7.5 | mg/kg | 9.2-95 | -- | 8,100 | -- | No |
| | Surface Water[e] | Barium | 170 | µg/L | <50-93 | -- | 256 | 2,000[d] | No |
| | | Calcium | 80,000 | µg/L | 4,500-88,000 | -- | -- | -- | No |
| | | Iron | 11,000 | µg/L | 180-2,800 | -- | -- | -- | No |
| | | Magnesium | 44,000 | µg/L | <5,000-53,000 | -- | -- | -- | No |
| | | Manganese | 270 | µg/L | <50-510 | -- | 18.3 | -- | No |
| | | Sodium | 130,000J | µg/L | 8,400-41,0000 | -- | -- | -- | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 56 FR 30266 (01 January 1991).
e The concentrations reported for metals in surface water are total metals.
J Result is an estimate.
--- Not applicable.

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## 3.2 DIESEL TANK (ST10)

### 3.2.1 Site Background

The Diesel Tank (ST10) site is the former location of a 20,000-gallon fuel tank located east of the module train and southwest of the new SRR technical services building. The site consists of tank supports and the associated pumphouse in a bermed gravel area located on the south edge of the gravel pad. The gravel pad and berm at the site are raised approximately three feet above the tundra, which is located south of the site. No records have indicated historical spills in the area, but previous sampling and analysis, conducted in 1989 by an Air Force contractor, indicate the presence of petroleum hydrocarbon contaminated soils.

Previous sampling, conducted in 1989 by Air Force contractors, detected petroleum hydrocarbons in one soil sample at the site. The concentration detected previously is presented in the RI/FS Work Plan (U.S. Air Force 1993).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 3.2.3.

### 3.2.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Diesel Tank site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**3.2.2.1 Summary of Samples Collected.** A total of 14 samples was collected during the RI from gravel pads and drainage areas at the site. These consisted of four soil, eight sediment, and two surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Diesel Tank (ST10) site are presented in Figure 3-2.

Four soil samples were analyzed for DRPH and RRPH. In addition, one sample was analyzed for GRPH and BTEX.

Eight sediment samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, two samples were analyzed for VOCs.

Two surface water samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, one sample was analyzed for VOCs, SVOCs, TOC, TSS, and TDS.

**3.2.2.2 Analytical Results.** The data summary table (Table 3-3) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 3-2. All organic compounds detected are

presented on the figure except when they were a result of laboratory contamination or decontamination procedures. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil and sediment samples at the site include DRPH, GRPH, BTEX compounds, and one other VOC commonly associated with diesel fuel. DRPH were detected in three soil/sediment samples at concentrations ranging from 390 to 900 mg/kg. GRPH were detected in three soil/sediment samples ranging from 12 to 380 mg/kg. BTEX compounds were detected in five soil/sediment samples at very low concentrations. Total BTEX concentrations ranged from 0.1 to 0.2 mg/kg; xylenes were the primary component. One other VOC (1,3,5-trimethylbenzene) was detected at 0.284 mg/kg in sediment sample ST10-SD03.

In surface water samples, only one organic compound (1,2-dichloroethane) was detected at 2 μg/L (sample ST10-SW03). 1,2-Dichloroethane was detected in all three background surface water samples at similar concentrations, and is assumed to be from the result of field decontamination procedures. The hexane and methanol used in the decontamination procedures may have contained impurities including 1,2-dichloroethane.

**Inorganics**. Metals were not a concern at the site, and no metals analyses were performed. TOC, TSS, and TDS were reported at 34,800, 16,000, and 1,300,000 μg/L, respectively, in surface water sample ST10-SW02.

**3.2.2.3 Summary of Site Contamination**. Sampling and analysis have determined that low levels of petroleum hydrocarbons (DRPH and GRPH) and VOCs (including BTEX) commonly associated with diesel fuel exist at the Diesel Tank (ST10) site.

Previous sampling conducted in 1989 at the Diesel Tank site detected petroleum hydrocarbons (TPH) at 5,600 mg/kg in one soil sample. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a).

A comparison of historical and current project data indicates that there is a lower concentration of petroleum hydrocarbons than there has been in the past. Organic compounds detected in soil during the 1993 RI include DRPH (900 mg/kg), GRPH (380 mg/kg), and low levels of VOCs (including BTEX) commonly associated with diesel fuels.

The suspected source of the petroleum compounds detected at the Diesel Tank site (ST10) is spills and/or leaks from the tank formerly located at the site. The contaminants detected are isolated in small areas adjacent to and inside the berm and do not appear to be migrating. The human health and ecological health risks associated with the chemicals detected at the site are presented in Sections 3.2.4 and 3.2.5.

### 3.2.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**3.2.3.1 Topography and Stratigraphy**. The Diesel Tank (ST10) site consists of a gravel berm around the south edge of the gravel pad which is placed on relatively flat tundra. The gravel berm is approximately 20 feet wide and 60 feet long and filled with water. A gravel pad is located adjacent to the north and east sides of the bermed portion of the site, and tundra is located south and west of the site. The adjacent tundra is flat and marshy, and small ponds are located adjacent to the berm. Drainage is radial, away from the site.

During the 1993 RI, permafrost was located at a depth of up to four feet under the gravel pads and at a depth of two feet under tundra areas. Gravel pads consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy found at Point Lonely (Section 2.4.4.2).

**3.2.3.2 Migration Potential.**

**Subsurface Migration**. The topography at the site suggests that subsurface migration would be to the south and west, and analytical data indicate that contaminants may have migrated in the subsurface through the west and south sides of the berm. However, due to the flat topography, the subsurface flow velocities in the tundra are considered to be low, and the potential for contaminant migration in active layer water at this site is correspondingly low.

**Surface Migration**. The primary route of surface migration over most of the site is overland sheet flow. Significant surface migration over the gravel pad area is probably restricted to the spring thaw when large quantities of meltwater are available and the frozen ground prevents active layer flow. Surface migration on the gravel pad will follow surface contours, which are generally radial from the gravel pad out to the tundra and surface water bodies that border the site. The flat, marshy topography of the tundra adjacent to the site lacks significant drainage outlets indicating that surface migration should occur very slowly.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Analytical data suggest that petroleum hydrocarbons are present to a limited extent in site soils along the berm and the pump house drain valve, but that the downgradient migration from the site in minimal. The flat, marshy topography and the lack of drainage outlets in the area indicate that any subsurface or surface migration should occur very slowly. Based upon the analytical results and site topography, the potential for contaminant migration from this site is considered to be low.

### 3.2.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors.** Potential human receptors at the Diesel Tank (ST10) site include Air Force contractor personnel occasionally working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with, and incidental ingestion of, soil/sediment and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers periodically at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at Point Lonely are presented in Section 3.2.4.

**Ecological Receptors.** Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 3.2.5.

## 3.2.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Diesel Tank (ST10) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the chemicals detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site

chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**3.2.4.1 Chemicals of Concern**. DRPH and GRPH were identified as COCs for the soil matrix at the Diesel Tank site. The concentrations of DRPH and GRPH exceeded their background concentrations and the ARAR concentration for petroleum hydrocarbon contamination of soil.

No COCs were identified for the surface water matrix at the Diesel Tank (ST10) site based on a comparison of the maximum concentrations of detected chemicals to their background, RBSL, and ARAR concentration. 1,2-Dichloroethane was reported in one surface water sample at a concentration of 2 μg/L. This concentration is less than the background concentration range of 1,2-dichloroethane (4.9 to 7.9 μg/L). These detections are assumed to be the result of field decontamination procedures. The hexane and methanol used in the decontamination procedures may have contained impurities including 1,2-dichloroethane.

Table 3-4, Identification of COCs at the Diesel Tank, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and the COCs selected in the risk evaluation.

**3.2.4.2 Exposure Pathways and Potential Receptors**. Because COCs were identified for soil/sediment and surface water at the site, the potential risks associated with ingestion of soil/sediment and ingestion of surface water were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**3.2.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments**. The noncancer hazard associated with the ingestion of soil at the Diesel Tank site by a hypothetical native northern adult/child is 0.01, and by a DEW Line worker is <0.001, based on the maximum concentrations of the COCs. The presence of DRPH and GRPH accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of soil/sediment at this site by a hypothetical native northern adult/child is $1 \times 10^{-7}$, and by a DEW Line worker is $3 \times 10^{-9}$, based on the maximum concentrations of the COC. The presence of GRPH accounts entirely for the quantifiable cancer risk for these receptor/pathway combinations.

**3.2.4.4 Noncancer Hazard and Cancer Risk Associated with Surface Water**. No COC was selected for the surface water at the Diesel Tank site based on a comparison of maximum concentrations of chemicals detected at the site to background concentrations, RBSLs, and ARARs.

**3.2.4.5 Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the soil/sediment at the Diesel Tank site are the low noncancer hazard (hazard indices of 0.01 and <0.001) and low cancer risk associated with GRPH. These risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one (EPA 1991b), and on the basis of the risk assessment remediation of the site is not necessarily warranted. No COC was selected for surface water at the site.

In conclusion, under current or future site uses the COCs identified in soil/sediment at the Diesel Tank site pose only a minimal, if any, potential threat to human health. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 3.2.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**3.2.5.1 Chemicals of Concern.** COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were selected in surface water at the Diesel Tank site. DRPH, GRPH, and benzene were considered COCs in soil/sediment. None of the identified COCs were associated with significant risk estimates under current conditions at the Diesel Tank site.

**3.2.5.2 Summary of Ecological Risk Assessment.** Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks under current conditions at the Diesel Tank site are minimal.

### 3.2.6 Conclusions and Recommendations

Sampling and analyses have determined that there is no significant contamination at the Diesel Tank (ST10) site. Only low levels of contaminants were detected in a limited area adjacent to the pump house valve and surrounding berm. The source is suspected to be previous leaks and/or spills associated with the diesel tank that was formerly located at this site. The installation is presently unmanned, and the diesel tank has been removed. Therefore, there is no longer a source of potential contaminants at the site. Migration of contaminants from the site appears minimal based on samples collected downgradient of the site.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The human health risk is not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are minimal. Therefore, considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Based on the RI sampling and analyses and the risk assessment, remedial actions are not warranted at the site. No significant human health or ecological risk was identified at the site. Therefore, the Diesel Tank (ST10) site is recommended for no further action.

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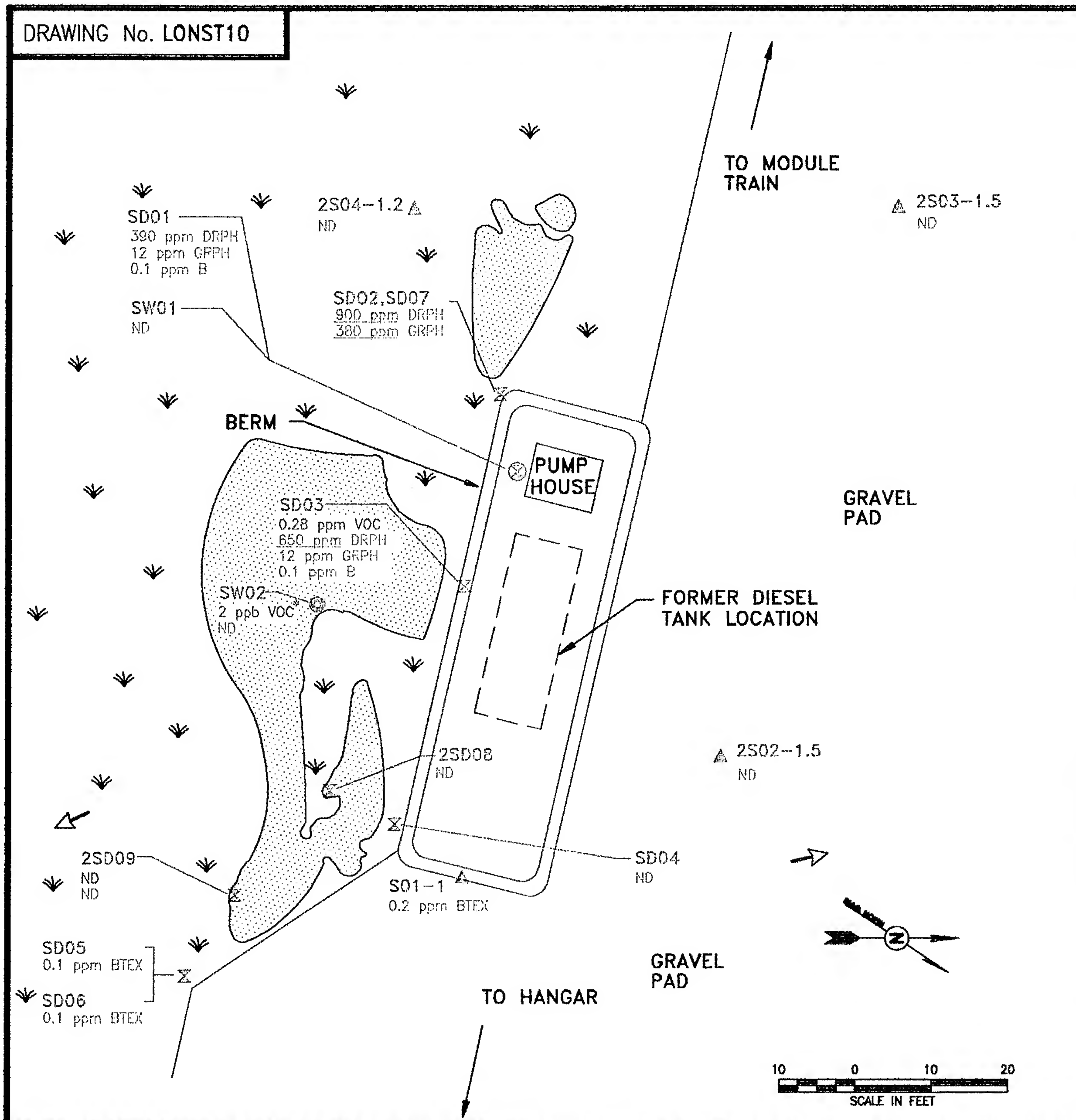


LEGEND

| | |
|---|---|
| | BUILDINGS, STRUCTURES |
| | ROADS |
| | SOIL SAMPLE |
| | SEDIMENT SAMPLE |
| | SURFACE WATER SAMPLE |
| | SEDIMENT AND WATER SAMPLES |
| | TUNDRA |
| | SURFACE WATER |
| | GRAVEL PAD BOUNDARY |
| | SURFACE DRAINAGE |
| 2.6 ppm | CT&E DATA |
| 0.9 ppm | F&B DATA |

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| VOC | TOTAL VOLATILE ORGANIC COMPOUNDS |
| DRPH | DIESEL RANGE PETROLEUM HYDROCARBONS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |
| B | BENZENE |

* COMMON LAB OR FIELD CONTAMINANT AND/OR DETECTED IN NUMEROUS BLANK SAMPLES.

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 3-2

DIESEL TANK (ST10) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 3-3. DIESEL TANK ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Diesel Tank (ST10)

Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01-1 | SD01 | SD02 & SD07 (Replicates) | | SD03 | AB02 | EB04 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 1050 | 1030 | 1024 | 1026 | 1028<br>4426-1 | 1094 | 1098<br>1100<br>4426-4 | 1092<br>4426-3 | #5-83093<br>#1&2-82893<br>4426 | #6-82993<br>#3&4-83193<br>#1&2-82893<br>4426 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5 | 50 | 500[a] | <190[b]-150J[b] | <50[b] | 380J[b] | 250J[b] | 900J[b] | 650J[b] | NA | <1,000J[b] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | <2J[b] | 12J[b] | 380J[b] | 130J[b] | 12J[b] | <50J[b] | <50J[b] | <50J[b] | NA | <2 |
| RRPH (Approx.) | 10-20 | 100-200 | 2,000[a] | <180-<670 | <100 | <200 | <150 | <230 | <120 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | 0.2J | 0.1J | <2.0J | <2.0 | 0.1J | | | | | |
| Benzene | 0.002-0.05 | 0.02-0.5 | 0.5 | <0.04-<0.3 | <0.02 | 0.1J | <0.5J | <0.4 | 0.1J | <1 | <2J | <6J | <1 | <0.02 |
| Toluene | 0.002-0.05 | 0.02-0.5 | | <0.2-0.5 | <0.02 | <0.2 | <0.5J | <0.4 | <0.2 | <1 | <2J | <4J | <1 | <0.02 |
| Ethylbenzene | 0.002-0.05 | 0.02-0.5 | | <0.2-0.2 | <0.02 | <0.2 | <0.5J | <0.4 | <0.2 | <1 | <2J | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.08 | 0.04-0.8 | | <0.4-2.0J | 0.2J | <0.4 | <0.5J | <0.8 | <0.4 | <2 | <2J | <3J | <2 | <0.04 |
| VOC 8260 | | | | | | | | | | | | | | |
| 1,3,5-Trimethylbenzene | 0.020 | 0.250 | | <0.300-0.409 | NA | NA | NA | NA | 0.284 | NA | <1 | <1 | <1 | <0.020 |
| SVOC 8270 | 0.200 | 0.250 | | <5.00-<30.0 | NA | NA | NA | NA | <0.250 | NA | <28 | NA | <15 | <0.200-1.160 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-3. DIESEL TANK ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Tank (ST10)

Matrix: Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SD04 | SD05 | SD06 | AB02 | EB04 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 1048 4426-1 | 1046 | 1052 | 1094 | 1100 1098 4426-4 | 1092 4426-3 | #5-83093 #1&2-82893 | #6-82993 #3&4-83193 #1&2-82893 4426 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-9 | 50-90 | 500[a] | <190[b]-150J[b] | <90[b] | <50[b] | <60[b] | NA | <1,000J[b] | NA | <1,000 | <50 |
| GRPH | 0.2-18 | 2-180 | 100 | <20J[b]-27J[b] | <180J[b] | <2J[b] | <2J[b] | <50J[b] | <50J[b] | <50J[b] | NA | <2 |
| RRPH (Approx.) | 11-13 | 110-130 | 2,000[a] | <180-<670 | <130 | <110 | <110 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <1.0J | 0.1J | 0.1J | | | | | |
| Benzene | 0.002-0.02 | 0.02-0.2 | 0.5 | <0.04-<0.3 | <0.2J | <0.02 | <0.02 | <1 | <2J | <6J | <1 | <0.02 |
| Toluene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.5 | <0.2J | <0.02 | <0.02 | <1 | <2J | <4J | <1 | <0.02 |
| Ethylbenzene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.2 | <0.2J | <0.02 | <0.02 | <1 | <2J | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.04 | 0.04-0.4 | | <0.4-2.0 | <0.4J | 0.1J | 0.1J | <2 | <2J | <3J | <2 | <0.04 |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-3. DIESEL TANK ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Tank (ST10)

Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2S02-1.5 | 2S03-1.5 | 2S04-1.2 | 2SD08 | 2SD09 | EB08 | | |
| Laboratory Sample ID Numbers | | | | | 1767 | 1772 | 1771 | 1768 | 1770 4626-12 | 1174 1176 4626-13 | #5-83093 #1&2-82893 4626 | #5-9693 #1&2-9793 4626 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | mg/kg |
| DRPH | 5-15 | 50-150 | 500[a] | <190[b]-150J[b] | <60[b] | <50[b] | <150[b] | <70[b] | <60[b] | 289J[cd] | <200-<1,000 | <50 |
| GRPH | 0.1 | 1 | 100 | <20J[b]-27J[b] | NA | NA | NA | NA | <1J[b] | <20[c] | <20 | <1 |
| RRPH (Approx.) | 12-30 | 120-300 | 2,000[a] | <180-<670 | <120 | <120 | <300 | <140 | <140 | <2,000 | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | NA | NA | NA | NA | <0.1 | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | NA | NA | NA | NA | <0.02 | <1 | <1 | <0.02 |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | NA | NA | NA | NA | <0.02 | <1 | <1 | <0.02-<0.03 |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | NA | NA | NA | NA | <0.02 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | NA | NA | NA | NA | <0.04 | <2 | <2 | <0.04-<0.09 |
| VOC 8260 | 0.020 | 0.030 | | <0.050-<0.500 | NA | NA | NA | NA | <0.030J | <1-3.9 | <1 | <0.020 |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L, respectively.
d The laboratory reported that the EPH pattern in this sample was not consistent with a middle distillate fuel.

# TABLE 3-3. DIESEL TANK ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Tank (ST10)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | | | | AB02 | EB04 | TB04 | |
| Laboratory Sample ID Numbers | | | | | 1054 1056 | 1058 1060 4426-2 | | | | 1094 | 1098 1100 4426-4 | 1092 4426-3 | #5-83093 #1&2-82893 4426 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000J[b] | <1,000J[b] | | | | NA | <1,000J[b] | NA | <1,000 |
| GRPH | 5 | 50 | | <100J[b] | <50J[b] | <50J[b] | | | | <50J[b] | <50J[b] | <50J[b] | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | | | | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | |
| Benzene | 0.1-0.7 | 1-7 | 5 | <1 | <7J | <1 | | | | <1 | <2J | <6J | <1 |
| Toluene | 0.1-0.3 | 1-3 | 1,000 | <1 | <3J | <1 | | | | <1 | <2J | <4J | <1 |
| Ethylbenzene | 0.1-0.8 | 1-8 | 700 | <1 | <3J | <1 | | | | <1 | <2J | <3J | <1 |
| Xylenes (Total) | 0.4-0.9 | 4-9 | 10,000 | <2 | <9J | <4J | | | | <2 | <2J | <3J | <2 |
| VOC 8260 | | | | | | | | | | | | | |
| 1,2-Dichloroethane | 1 | 1 | 5 | <10 | NA | 2 | | | | NA | <1 | <1 | <1 |
| SVOC 8270 | 10 | 10 | | <10.2-<11 | NA | <10 | | | | NA | <26 | NA | <15 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | NA | 34,800 | | | | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | NA | 16,000 | | | | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | NA | 1,300,000 | | | | NA | NA | NA | <10,000 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-4. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE DIESEL TANK (ST10)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Diesel Tank (ST10) | Soil | DRPH | 900J | mg/kg | <190-150J | -- | -- | 500[c] | **Yes** |
| | | GRPH | 380J | mg/kg | <20J-27J | -- | -- | 100[c] | **Yes** |
| | | Benzene | 0.1J | mg/kg | <0.04-<0.5 | 2.2 | -- | 0.5[c] | No |
| | | Xylenes (Total) | 0.2J | mg/kg | <0.4-2.0 | -- | 54000 | -- | No |
| | | 1,3,5-Trimethylbenzene | 0.284 | mg/kg | <0.300-0.409 | -- | -- | -- | **Yes*** |
| | Surface Water | 1,2-Dichloroethane | 2B | µg/L | 4.9-7.9 | 0.934 | -- | 5[d] | No |

* Chemicals without an RBSL or ARAR are considered chemicals of potential concern and are discussed in the Final Point Lonely Risk Assessment, Section 2.1.5. (U.S. Air Force 1996).
a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
B The analyte was less than five times the range of the concentrations detected in background surface water samples and equipment blanks; therefore, 1,2-dichloroethane is not considered a COC.
J Result is an estimate.
--- Not applicable.

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## 3.3 INACTIVE LANDFILL (LF11)/VEHICLE STORAGE AREA (SS14)

### 3.3.1 Site Background

The Inactive Landfill is located along the west side of the road to Freshwater Lake in the same location as the Vehicle Storage Area (SS14). This landfill was active until the installation closure in 1989. The landfill is covered with a gravel cap and a gravel pile is present at the site.

The Vehicle Storage Area (SS14) is co-located with the Inactive Landfill. This site, like the Inactive Landfill, has been regraded and otherwise modified such that its shape in 1993 differed substantially from that indicated on earlier site maps. An adjoining gravel pad north of the largest pad making up the Inactive Landfill site (LF11) was tentatively identified as the Vehicle Storage Area; however, there was no discernable boundary so these two areas were sampled as one site. The surface consisted of relatively clean gravel with occasional, scattered small trash items.

Previous sampling, conducted in 1989 by Air Force contractors, detected petroleum hydrocarbons in the soil (Radian 1989b). A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 3.3.3.

### 3.3.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**3.3.2.1 Summary of Samples Collected.** A total of ten samples was collected at the site. These consisted of four soil, three sediment, and three surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site are presented in Figure 3-3.

Four soil samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, and PCBs. In addition, one soil sample was analyzed for SVOCs, pesticides, and total metals.

Three sediment samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, and PCBs.

Three surface water samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, and PCBs. In addition, one water sample was analyzed for VOCs, SVOCs, total and dissolved metals, TOC, TSS, and TDS.

**3.3.2.2 Analytical Results.** The data summary table (Table 3-5) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels,

associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds and inorganic analytes with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 3-3. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. Only metals detected above background levels that exceed an RBSL or an ARAR are presented on Figure 3-3. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds and inorganic analytes detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil and sediment samples collected at the site include GRPH and BTEX compounds. GRPH were detected in sediment sample LF11-SD02 at a concentration of 8 mg/kg. BTEX total was detected in the same sediment sample at 1.4 mg/kg; xylenes were the primary component.

In surface water samples, organic compounds detected include GRPH and BTEX compounds. GRPH were detected in surface water sample LF11-SW03 at 200 µg/L. BTEX compounds were detected in the same surface water sample at concentrations ranging from 4 to 17 µg/L. Toluene was the primary component (17 µg/L).

**Inorganics**. Metals analyses indicated that one metal (magnesium) was detected at a concentration above background levels in one soil sample at this site. Magnesium was detected at 29,000 mg/kg in soil sample LF11-S03.

In surface water samples, metals analysis detected three metals (barium, calcium, and potassium) at levels above background concentrations. Barium, calcium, and potassium were detected at 350, 97,000, and 57,000 µg/L, respectively, in surface water sample LF11-SW01.

TOC, TSS, and TDS were reported at 28,100, 5,000, and 768,000 µg/L, respectively, in surface water sample LF11-SW01.

**3.3.2.3 Summary of Site Contamination**. Previous sampling conducted in 1989 at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) detected petroleum hydrocarbons (TPH) at 110 mg/kg in the soil. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

A comparison of historical and current project data indicates that there is a lower concentration of petroleum hydrocarbons in soil than there has been in the past. Compounds detected in soil and surface water during the 1993 RI include low levels of GRPH and BTEX compounds, which are commonly associated with diesel fuel. The human health and ecological risks associated with chemicals detected at the site are presented in Section 3.3.4 and 3.3.5. The suspected source of contaminants detected during sampling conducted at the Inactive Landfill/Vehicle

Storage Area is fuel spills and/or leaks from the previous vehicle storage activities or from previous waste disposal practices.

### 3.3.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**3.3.3.1 Topography and Stratigraphy**. The site consists of a well-graded gravel cap/pad placed on the tundra adjacent to the road (Figure 3-3). The topography in this area is generally flat. The gravel pads and roads, which are approximately four feet thick, provide the greatest topographic relief at the site. A large gravel pile is located on the gravel pad in the northwest corner. Drainage in the area is generally flat; however, drainage from the site is radial, away from the gravel cap/pad.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

**3.3.3.2 Migration Potential.**

**Subsurface Migration**. Except for very low levels of GRPH and BTEX in one soil and one surface water sample, no analytes were detected at the site. Based upon these results, the potential for subsurface migration is considered to be limited.

**Surface Migration**. Analytes were detected in only one of the surface water samples collected from the site. In this sample, which was collected in one of the tundra ponds adjacent to the gravel pad, only low levels of GRPH and BTEX compounds were detected. Thus, the potential for contaminant migration is considered to be low.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential.** The lack of significant contamination detected in surface water and soil/sediment samples indicates that the potential for surface and subsurface contaminant migration is probably limited. Analytical data indicate that contaminants are not migrating offsite. The potential for surface and subsurface contaminant migration from the site is considered to be low.

**3.3.3.3 Receptors and Chemical Concentrations at Receptors.**

**Human Receptors**. Potential human receptors at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site include Air Force contractor personnel occasionally working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or

subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers periodically at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at the site are presented in Section 3.3.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 3.3.5.

### 3.3.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**3.3.4.1 Chemicals of Concern.** No COCs were identified for the soil matrix at the Inactive Landfill/Vehicle Storage Area based on a comparison of the maximum concentrations of detected chemicals to their background, RBSL, and ARAR concentrations.

GRPH, benzene, and barium were identified as COCs for the surface water matrix at the site. The maximum concentrations of GRPH and benzene exceeded their background concentrations and the RBSLs based on cancer risk. Barium exceeded the surface water RBSL based on noncancer hazard.

Table 3-6, Identification of COCs at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14), presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and the COCs selected in the risk evaluation.

**3.3.4.2 Exposure Pathways and Potential Receptors.** Because no COCs were identified for soil/sediment at the site, only ingestion of surface water was evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**3.3.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** No COCs were selected for the soil at the Inactive Landfill site. This does not indicate that exposure to chemicals in the soil at the site is without health risk; however, the concentrations measured were less than the concentrations considered acceptable under Region 10 guidance (EPA 1991a) or ARARs.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** The noncancer hazard associated with the ingestion of surface water at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site by a hypothetical native northern adult or by a DEW Line worker is 0.007, based on the maximum concentrations of the COCs. GRPH and barium account entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of surface water at this site by a native northern adults is $5 \times 10^{-6}$, and by a DEW Line worker is $9 \times 10^{-7}$, based on the maximum concentrations of the COCs. The presence of GRPH and benzene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**3.3.4.4 Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the surface water at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) are the very low noncancer hazard (hazard index of 0.007), and low cancer risk associated with the GRPH and benzene. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-4}$ and the noncancer hazards do not significantly exceed one (EPA 1991b), and on the basis of the risk assessment remediation of the site is not

warranted. In addition, the potential risks and hazards were calculated assuming the affected surface water would be used as a sole-source water supply for 180 days per year. Based on site-specific information, the chemicals in surface water do not currently pose a health hazard nor are they likely to pose a hazard in the future. The surface water expressions at the site are frozen most of the year; many are only intermittently filled with water during the summer months. The surface water at the site is not known to be used as a water supply now, nor has it been used in the past.

In conclusion, under current or future uses, the COCs identified in surface water at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site pose only a minimal, if any, potential threat to human health. The cancer risks and noncancer hazards calculated for surface water at the site are below levels at which remediation is usually required. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 3.3.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**3.3.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were identified in the soil/sediment matrix at the site. The one COC identified in surface water at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site was GRPH. The identified COC was not associated with significant ecological risk estimates at the Inactive Landfill/Vehicle Storage Area site.

**3.3.5.2 Summary of Ecological Risk Assessment**. Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Inactive Landfill/Vehicle Storage Area site are minimal.

### 3.3.6 Conclusions and Recommendations

Sampling and analyses have determined that there is no significant contamination at the Inactive Landfill (LF11)/Vehicle Storage Area (SS14). Only very low levels of contaminants were detected. The source, although unknown, is possibly isolated spills or leaks caused by previous vehicle storage activities at the site, or from previous waste disposal practices. The installation and site are presently inactive, so waste is no longer being disposed at the site. Analytical data indicate that migration of contaminants from the site is minimal.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The very low potential hazards

and risks are based on a future scenario in which the site surface water would be used as a sole-source drinking water supply. Even using the conservative future scenario, the potential risks at the site are not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are minimal. Therefore, considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Based on the RI sampling and analyses and the risk assessment, remedial actions are not warranted at the site. No significant human health or ecological risk was identified at the site. Therefore, the Inactive Landfill (LF11)/Vehicle Storage Area (SS14) site is recommended for no further action.

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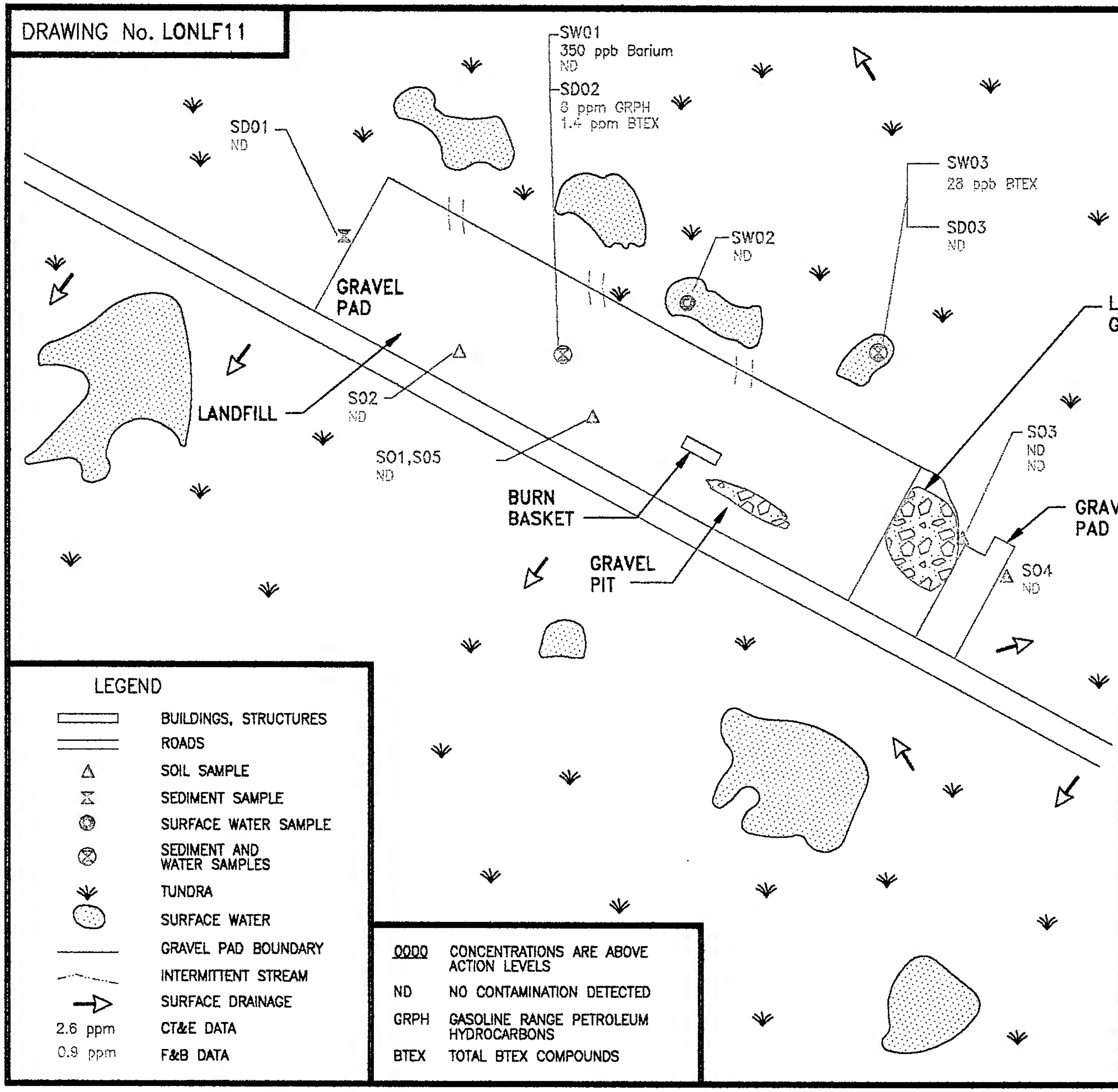


FIGURE NO. 3-3
INACTIVE LANDFILL (LF11)/
VEHICLE STORAGE AREA (SS14)
SAMPLE LOCATIONS
AND
ANALYTICAL RESULTS

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# TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Inactive Landfill (LF11)
Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 & S05 (Replicates) | | S02 | S03 | S04 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 946 | 954 | 948 | 950 4425-5 | 952 | 1094 | 942 4425-9 | 916 4425-8 | #5-82893 4425 | #6-82893 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-6 | 50-60 | 500[a] | <190[b]-150J[b] | <50[b] | <60[b] | <50[b] | <60[b] | <60[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-1 | 2-10 | 100 | <20J[b]-27J[b] | <2J[b] | <2J[b] | <2J[b] | <2J[b] | <10J[b] | <50[b] | <100J[b] | <100J[b] | NA | NA |
| RRPH (Approx.) | 10-12 | 100-120 | 2,000[a] | <180-<670 | <100 | <120 | <100 | <110 | <100 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | <0.10 | <0.10 | <0.10 | <0.20J | | | | | |
| Benzene | 0.002-0.04 | 0.02-0.4 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <0.4J | <1 | <1 | <1 | NA | NA |
| Toluene | 0.002-0.04 | 0.02-0.4 | | <0.2-0.5 | <0.02 | <0.02 | <0.02 | <0.02 | <0.4J | <1 | <1 | <1 | NA | NA |
| Ethylbenzene | 0.002-0.04 | 0.02-0.4 | | <0.2-0.2 | <0.02 | <0.02 | <0.02 | <0.02 | <0.4J | <1 | <1 | <1 | NA | NA |
| Xylenes | 0.004-0.08 | 0.04-0.8 | | <0.4-2.0J | <0.04 | <0.04 | <0.04 | <0.04 | <0.8J | <2 | <2 | <2 | NA | NA |
| HVOC 8010 | 0.002 | 0.02 | | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | NA | NA |
| VOC 8260 | | | | | | | | | | | | | | |
| 1,2-Dichloroethane | 0.020 | 0.020 | | <0.300-<0.500 | NA | NA | NA | <0.020J | NA | NA | 1.3 | <1 | <1 | <0.020 |
| SVOC 8270 | 0.200 | 0.220-2.82 | | <5.00-<30.0 | NA | NA | NA | <0.220-2.82U | NA | NA | <1 | NA | <1 | <0.200-0.878 |
| PCBs | 0.01 | 0.1 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | NA | <2 | NA | <2 | <0.1 |
| Pesticides | 0.001-0.05 | 0.01-0.5 | | <0.02J-<0.5J | NA | NA | NA | <0.01J-<0.5J | NA | NA | <2 | NA | NA | NA |

□ CT&E Data.
▒ F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Inactive Landfill (LF11)

Matrix: Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SD01 | SD02 | SD03 | AB02 | EB03 | EB04 | TB03 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 956 | 958 | 960 | 1094 | 942/944 | 1098<br>1100 | 916 | 1092 | #5-83093<br>#5-82893 | #6-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 6 | 60 | 500[a] | <190[b]-150J[b] | <60[b] | <60[b] | <60[b] | NA | <1,000[b] | <1,000J[b] | NA | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | <2J[b] | 8J[b] | <2J[b] | <50J[b] | <100J[b] | <50J[b] | <100J[b] | <50J[b] | NA | NA |
| RRPH (Approx.) | 12 | 120 | 2,000[a] | <180-<670 | <120 | <120 | <120 | NA | <2,000 | <2,000 | NA | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | 1.4 | <0.10 | | | | | | | |
| Benzene | 0.002-0.008 | 0.02-0.08 | 0.5 | <0.04-<0.3 | <0.02 | <0.08 | <0.02 | <1 | <1 | <2J | <1 | <5J | NA | NA |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | <0.02 | <0.02 | <0.02 | <1 | <1 | <2J | <1 | <4J | NA | NA |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | <0.02 | 0.2 | <0.02 | <1 | <1 | <2J | <1 | <3J | NA | NA |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | <0.04 | 1.2 | <0.04 | <2 | <2 | <2J | <2 | <3J | NA | NA |
| HVOC 8010 | 0.002 | 0.02 | | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <1 | NA | NA |
| PCBs | 0.01 | 0.1 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.1 | NA | <2 | <2 | NA | NA | <2 | <0.1 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Inactive Landfill (LF11)

Matrix: Soil
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S03 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4425-5 | | | | | 4425-9 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | | | µg/L | µg/L |
| Aluminum | 0.35 | 2 | | <1,500-25,000 | 4,300 | | | | | <100 | <100 |
| Antimony | N/A | 53 | | <7.8-<230 | <53J | | | | | <100 | <100 |
| Arsenic | 0.11 | 53 | | <4.9-8.5 | <53 | | | | | <100 | <100 |
| Barium | 0.024 | 1 | | 28-390 | 110 | | | | | <50 | <50 |
| Beryllium | N/A | 27 | | <2.6-6.4 | <27 | | | | | <50 | <50 |
| Cadmium | 0.33 | 2.7 | | <3.0-<36 | <2.7 | | | | | <50 | <50 |
| Calcium | 0.69 | 4 | | 360-59,000 | 50,000 | | | | | 250 | 283 |
| Chromium | 0.066 | 1 | | <4.3-47 | 9.0J | | | | | <50 | <50 |
| Cobalt | N/A | 5.3 | | <5.1-12 | <5.3 | | | | | <100 | <100 |
| Copper | 0.045 | 1 | | <2.7-45 | 4.7 | | | | | <50 | <50 |
| Iron | 0.50 | 2 | | 5,400-35,000 | 12,000 | | | | | <100 | 107 |
| Lead | 0.13 | 5.3 | | <5.1-22 | <5.3 | | | | | <100 | <100 |
| Magnesium | 0.96 | 4 | | 360-7,400 | 29,000 | | | | | <200 | <200 |
| Manganese | 0.025 | 1 | | 25-290 | 130 | | | | | <50 | <50 |
| Molybdenum | N/A | 2.7 | | <2.5-<11 | <2.7 | | | | | <50 | <50 |
| Nickel | 0.11 | 1 | | 4.2-46 | 6.9 | | | | | <50 | <50 |
| Potassium | 23 | 100 | | <300-2,200 | 410J | | | | | <5,000 | <5,000 |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

## TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Inactive Landfill (LF11)

Matrix: Soil
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S03 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4425-5 | | | | | 4425-9 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | | | µg/L | µg/L |
| Selenium | 1.3 | 5.3 | | <7.8-<170 | <5.3 | | | | | <100 | <100 |
| Silver | 0.53 | 2.7 | | <3-<110 | <2.7J | | | | | <50 | <50 |
| Sodium | 0.55 | 5 | | <160-680 | 320J | | | | | 420 | <250 |
| Thallium | 0.011 | 0.26 | | <0.2-<1.2 | <0.26 | | | | | <5 | <5 |
| Vanadium | 0.036 | 1 | | 6.3-59 | 23 | | | | | <50 | <50 |
| Zinc | 0.16 | 1 | | 9.2-95 | 14 | | | | | <50 | <50 |

☐ CT&E Data.
J Result is an estimate.

## TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Inactive Landfill (LF11)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | SW03 | | | AB02 | EB03 | TB03 | |
| Laboratory Sample ID Numbers | | | | | 892 894 4428-1 | 896 898 | 902 904 | | | 1094 | 942 944 4425-9 | 916 | #5-82893 4428 4425 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | | | NA | <1,000[b] | NA | <1,000 |
| GRPH | 10 | 100 | | <100J[b] | <100J[b] | <100J[b] | 200J[ab] | | | <50J[b] | <100J[b] | <100J[b] | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | | | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | 4 | | | <1 | <1 | <1 | NA |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | 17 | | | <1 | <1 | <1 | NA |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | <1 | | | <1 | <1 | <1 | NA |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | <2 | 7J | | | <2 | <2 | <2 | NA |
| HVOC 8010 | 0.1 | 1 | | <1 | <1 | <1 | <1 | | | <1 | <1 | <1 | NA |
| VOC 8260 | 1 | 1 | | <1-7.9 | <1 | NA | NA | | | NA | <1-1.3 | NA | <1 |
| SVOC 8270 | 10 | 20 | | <10.2-<11 | <20 | NA | NA | | | NA | <12 | NA | <10 |
| PCBs | 0.2 | 2 | 0.5 | <2 | <2J | <2 | <2 | | | NA | <2 | NA | <2 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 28,100 | NA | NA | | | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | 5,000 | NA | NA | | | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 768,000 | NA | NA | | | NA | NA | NA | <10,000 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a Total petroleum hydrocarbons in this water sample exceed the 15 µg/L stated for fresh water in ADEC's Water Quality Criteria 18AAC70 (ADEC 1989).
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Inactive Landfill (LF11)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL
(DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4428-1 | | | | | 4425-9 | 4428 4425 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Aluminum | 17.4 | 100 | | <100-350 (<100-340) | <100 (<100) | | | | | <100 | <100 |
| Antimony | N/A | 100 | 6 | <100 (<100) | <100 (<100) | | | | | <100 | <100 |
| Arsenic | 5.3 | 100 | 50 | <100 (<100) | <100 (<100) | | | | | <100 | <100 |
| Barium | 1.2 | 50 | 2,000 | <50-93 (<50-91) | 350 (350) | | | | | <50 | <50 |
| Beryllium | N/A | 50 | 4 | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Cadmium | 1.7 | 50 | 5 | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Calcium | 34.5 | 200 | | 4,500-88,000 (4,100-86,000) | 97,000 (97,000) | | | | | 250 | <200 |
| Chromium | 3.29 | 50 | 100 | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Cobalt | N/A | 100 | | <100 (<100) | <100 (<100) | | | | | <100 | <100 |
| Copper | 2.3 | 50 | 1,300 | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Iron | 25 | 100 | | 180-2,800 (<100-1,600) | 1,500 (420) | | | | | <100 | <100 |
| Lead | 6.6 | 100 | | <100 (<100) | <100 (<100) | | | | | <100 | <100 |

☐ CT&E Data.
N/A Not available

# TABLE 3-5. INACTIVE LANDFILL ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Inactive Landfill (LF11)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL (DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4428-1 | | | | | 4425-9 | 4428<br>4425 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Magnesium | 47.8 | 200 | | <5,000-53,000<br>(2,600-54,000) | 41,000<br>(40,000)J | | | | | <200 | <200 |
| Manganese | 1.24 | 50 | | <50-510<br>(<50-120) | 220<br>(200) | | | | | <50 | <50 |
| Molybdenum | N/A | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Nickel | 5.5 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Potassium | 1,154 | 5,000 | | <5,000<br>(<5,000) | 5,700<br>(<5,000) | | | | | <5,000 | <5,000 |
| Selenium | 62.4 | 100 | 50 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Silver | 2.6 | 50 | 50 | <50<br>(<50) | <50J<br>(<50) | | | | | <50 | <50 |
| Sodium | 27.7 | 250 | | 8,400-410,000<br>(8,200-450,000) | 63,000J<br>(64,000) | | | | | 420 | <250 |
| Thallium | .57 | 5 | 2 | <5<br>(<5) | <5<br>(<5) | | | | | <5 | <5 |
| Vanadium | 1.8 | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Zinc | 8.2 | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

## TABLE 3-6. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE INACTIVE LANDFILL (LF11)/VEHICLE STORAGE AREA (SS14)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Inactive Landfill (LF11) | Soil | GRPH | 8J | mg/kg | <20J-27J | -- | -- | 100[c] | No |
| | | Ethylbenzene | 0.2 | mg/kg | <0.2-0.2 | -- | 2,700 | -- | No |
| | | Xylenes (total) | 1.2 | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | | Aluminum | 4,300 | mg/kg | <1,500-25,000 | -- | -- | -- | No |
| | | Barium | 110 | mg/kg | 28-390 | -- | 1,890 | -- | No |
| | | Calcium | 50,000 | mg/kg | 360-59,000 | -- | -- | -- | No |
| | | Chromium | 9.0J | mg/kg | <4.3-47 | -- | 135 | -- | No |
| | | Copper | 4.7 | mg/kg | <2.7-45 | -- | 999 | -- | No |
| | | Iron | 12,000 | mg/kg | 5,400-35,000 | -- | -- | -- | No |
| | | Magnesium | 29,000 | mg/kg | 360-7,400 | -- | -- | -- | No |
| | | Manganese | 130 | mg/kg | 25-290 | -- | 3,780 | -- | No |
| | | Nickel | 6.9 | mg/kg | 4.2-46 | -- | 540 | -- | No |
| | | Potassium | 410J | mg/kg | <300-2,200 | -- | -- | -- | No |
| | | Sodium | 320J | mg/kg | <160-680 | -- | -- | -- | No |
| | | Vanadium | 23 | mg/kg | 6.3-59 | -- | 189 | -- | No |
| | | Zinc | 14 | mg/kg | 9.2-95 | -- | 8,100 | -- | No |
| | Surface Water[g] | GRPH | 200J | µg/L | <50-<100 | 50 | 730 | -- | **Yes** |
| | | Benzene | 4 | µg/L | <1 | 0.617 | -- | 5[d] | **Yes** |
| | | Toluene | 17 | µg/L | <1 | -- | 96.5 | 1,000[e] | No |
| | | Xylenes (total) | 7J | µg/L | <2 | -- | 7,300 | 10,000[e] | No |
| | | Barium | 350 | µg/L | <50-93 | -- | 256 | 2,000[f] | **Yes** |
| | | Calcium | 97,000 | µg/L | 4,500-88,000 | -- | -- | -- | No |
| | | Iron | 1,500 | µg/L | 180-2,800 | -- | -- | -- | No |
| | | Magnesium | 41,000 | µg/L | <5,000-53,000 | -- | -- | -- | No |

## TABLE 3-6. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE INACTIVE LANDFILL (LF11)/VEHICLE STORAGE AREA (SS14) (CONTINUED)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Inactive Landfill | Surface Water | Manganese | 220 | µg/L | <50-510 | -- | 18.3 | -- | No |
| (LF11) | (Continued) | Potassium | 5,700 | µg/L | <5,000 | -- | -- | -- | No |
| (Continued) | | Sodium | 630,00J | µg/L | 8,400-410,000 | -- | -- | -- | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
e MCL, 56 FR 3526 (30 January 1991).
f MCL, 56 FR 30266 (01 January 1991).
g The concentrations reported for metals in surface water are total metals.
J Result is an estimate.
--- Not applicable.

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## 3.4 MODULE TRAIN (SS12)

### 3.4.1 Site Background

This site is located below and adjacent to the west end of the Module Train, below the diesel generators and diesel day tanks. The site consists of the gravel pad and tundra, and is in the area of a previous diesel spill.

Previous sampling, conducted in 1989 by Air Force contractors, detected petroleum hydrocarbons (TPH) at the site. A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 3.4.3.

### 3.4.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Module Train (SS12) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**3.4.2.1 Summary of Samples Collected.** A total of eight samples was collected at the site. These consisted of four soil, two sediment, and two surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Module Train (SS12) site are presented in Figure 3-4.

Four soil samples were analyzed for DRPH and RRPH. In addition, three soil samples were analyzed for GRPH, BTEX, and HVOCs. One soil sample was analyzed for VOCs, and SVOCs.

Two sediment samples were analyzed for DRPH and RRPH. In addition, one sample was analyzed for GRPH, BTEX, and HVOCs.

Two surface water samples were analyzed at this site. One sample was analyzed for DRPH, RRPH, and one sample was analyzed for GRPH, BTEX, VOCs, SVOCs, TOC, TSS, and TDS.

**3.4.2.2 Analytical Results**. The data summary table (Table 3-7) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 3-4. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil and sediment samples collected at the site include RRPH and one SVOC. RRPH were detected in one soil sample, SS12-S03, at 560 mg/kg. One SVOC, styrene, was detected at a very low concentration (0.08 mg/kg) in sediment sample SS12-S03. Styrene is a common component of diesel fuel.

In surface water samples, organic compounds detected are limited to two VOCs. Toluene was detected in surface water sample SS12-SW01 at 1.6 μg/L. In addition, one VOC detected in a surface water sample was detected at similar concentrations in a field blank. This compound, 1,2-dichloroethane, was detected at 3.1 μg/L in the environmental samples, 3.9 μg/L in the field blank, and ranged from 4.9 to 7.9 μg/L in the background samples. These detections are assumed to be the result of field decontamination procedures. The hexane and methanol used in the decontamination procedures may have contained impurities including 1,2-dichloroethane.

**Inorganics**. Metals were not a concern at this site, and no metals analyses were performed. TOC, TSS, and TDS were reported at 43,700, 74,000, and 615,000 μg/L, respectively, in surface water sample SS12-SW01.

**3.4.2.3 Summary of Site Contamination**. Previous sampling conducted in 1989 at the Module Train (SS12) detected petroleum hydrocarbons (TPH) in a soil sample at 24,000 mg/kg at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

A comparison of historical and current project data indicates that there is a lower concentration of petroleum hydrocarbons in soil than there has been in the past. Two compounds were detected at low concentrations in soil during the 1993 RI and include one SVOC in soil and one VOC in surface water that are both common components of diesel fuel. Differences between past and current data are likely to be a result of natural biodegradation as well as more extensive sampling during the 1993 RI. The human health and ecological risks associated with chemicals detected at the site are presented in Section 3.4.4 and 3.4.5. The suspected source of contaminants detected during sampling conducted at the Module Train is fuel spills and/or leaks from the diesel day tank at the west end of the Module Train.

### 3.4.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**3.4.3.1 Topography and Stratigraphy**. The site consists of the west end of the module train building, a gravel pad, and tundra. The topography in this area is generally flat. The gravel pad, which is approximately four feet thick, provides the greatest topographic relief at the site.

The area below the module train is at a slightly higher elevation than the tundra, but no known culverts lead out from below the west end of the module train to the tundra.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

### 3.4.3.2 Migration Potential.

**Subsurface Migration**. Except for low levels of RRPH and styrene in one soil sample, very low levels of two VOCs in one surface water sample, no analytes were detected in samples collected at the site. Contaminants do not appear to be migrating from this site. Based upon these results, the potential for subsurface migration of contaminants is considered to be limited.

**Surface Migration**. Analytes were detected in only one of the surface water samples collected from the site. In this sample, which was collected in one of the small ponds near the southwest corner of the building, toluene was detected at a concentration of 1.6 µg/L. The surrounding flat tundra is marshy and surface migration may occur through the marsh; however, analytical results indicate migration is not occurring. Based upon this, the potential for contaminant migration is considered to be limited.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. The flat topography and lack of significant contamination detected in soil/sediment and surface water samples indicate that the potential for surface and subsurface migration of contaminants at the site is limited.

### 3.4.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the Module Train (SS12) site include Air Force contractor personnel occasionally working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers periodically at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum

concentration of each chemical detected at the site. The potential risks to human health associated with chemicals detected at the site are presented in Section 3.4.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 3.4.5.

### 3.4.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Module Train (SS12) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**3.4.4.1 Chemicals of Concern**. No COCs were identified for the soil/sediment or surface water matrices at the Module Train site based on a comparison of the maximum concentrations of detected chemicals to their background concentrations, RBSLs, and ARARs.

Table 3-8, Identification of COCs at the Module Train, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs.

**3.4.4.2 Summary of Human Health Risk Assessment**. There were no COCs identified in the soil/sediment or surface water matrices at the Module Train site. Therefore, there were no COCs to evaluate. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 3.4.5 Ecological Risk Assessment

The objective of the ERA was to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**3.4.5.1 Chemicals of Concern.** COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were identified in surface water or soil/sediment at the Module Train site. As a result, no COCs were associated with significant risk estimates at the site.

**3.4.5.2 Summary of Ecological Risk Assessment.** Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Module Train site are unlikely.

### 3.4.6 Conclusions and Recommendations

Sampling and analyses have determined that there is no significant contamination at the Module Train (SS12) site. Only relatively low levels of contaminants were detected. Their source is suspected to be previous spills and/or leaks from the day tanks at the west end of the Module Train. The Module Train is no longer active.

There does not appear to be any significant migration of contaminants from the site based on the surface water and sediment samples collected in drainage pathways leading from the site.

There were no COCs identified for soil/sediment or surface water in either the human health or ecological risk assessment. Therefore, risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses.

Based on the RI sampling and analyses, risk assessment, and current or future site uses, remedial actions are not warranted at the site. No significant human health or ecological risks were identified at the site. Therefore, the Module Train (SS12) site is recommended for no further action.

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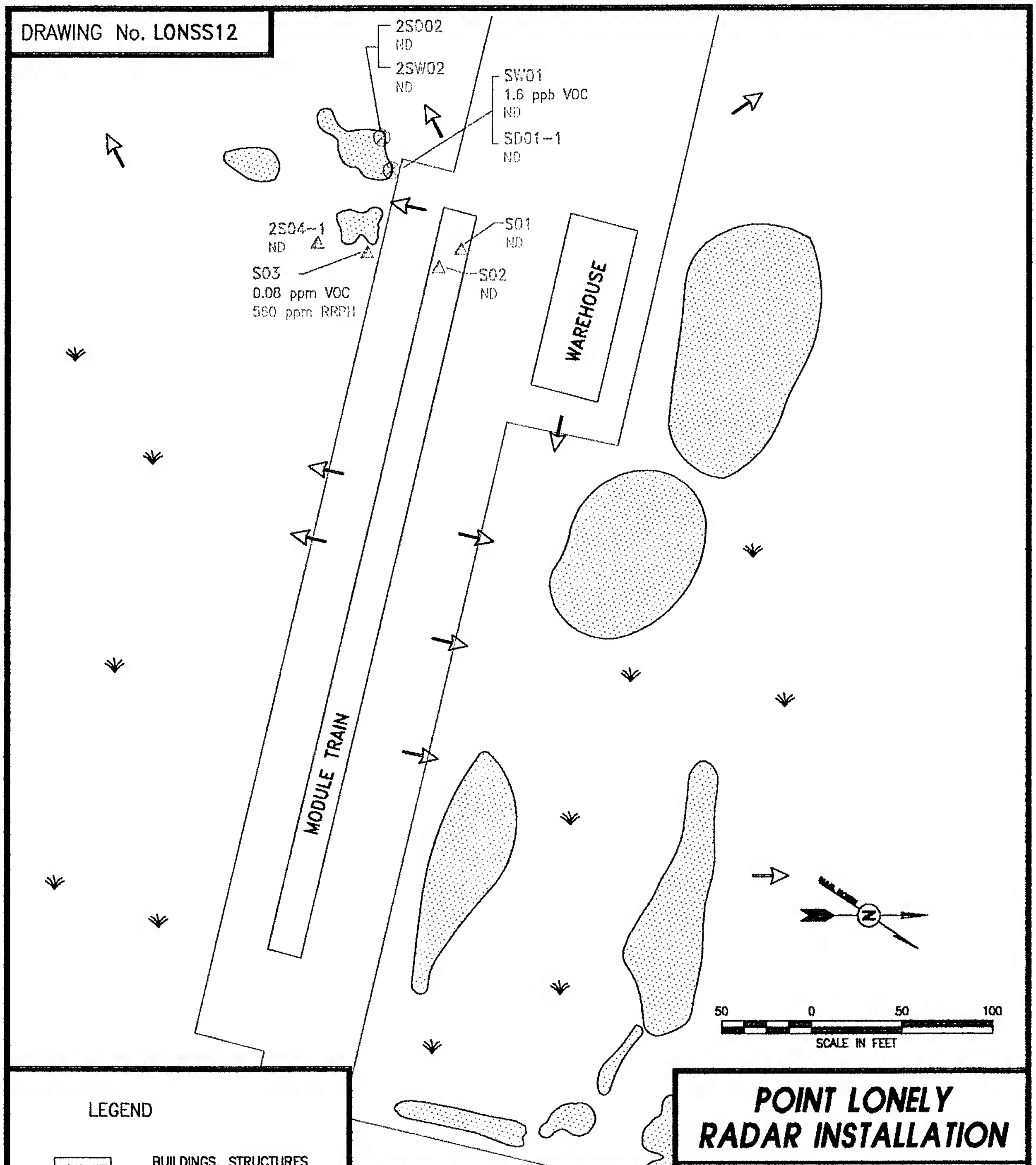


LEGEND

| | |
|---|---|
| | BUILDINGS, STRUCTURES |
| | SOIL SAMPLE |
| | SEDIMENT AND WATER SAMPLES |
| | TUNDRA |
| | SURFACE WATER |
| | GRAVEL PAD BOUNDARY |
| | SURFACE DRAINAGE |
| 2.6 ppm | CT&E DATA |
| 0.9 ppm | F&B DATA |

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| VOC | TOTAL VOLATILE ORGANIC COMPOUNDS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| RRPH | RESIDUAL RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |
| B | BENZENE |

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 3-4

MODULE TRAIN (SS12) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 3-7. MODULE TRAIN ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Module Train (SS12)

Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | S02 | S03 | SD01-1 | AB01 | EB01 | TB01 | | |
| Laboratory Sample ID Numbers | | | | | 502 | 506 | 504 4355-1 | 516 | 906 | 530/534 4357-1 | 528 4357-8 | #5-82793 #3&4-82593 4357 | #5-82593 #1&2-82593 4355 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 5-6 | 50-60 | 500[a] | <190[b]-150J[b] | <50[b] | <50[b] | <50[b] | <60[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | <2J[b] | <2J[b] | <2J[b] | <2J[b] | <100J[b] | <50J[b] | <100J[b] | <50 | <1 |
| RRPH (Approx.) | 10-12 | 100-120 | 2,000[a] | <180-<670 | <100 | <100 | 560 | <120 | NA | <2000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | <0.10 | <0.10 | <0.10 | | | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | <0.04 | <0.04 | <0.04 | <0.04 | <2 | <2 | <2 | <2 | <0.04 |
| HVOC 8010 | 0.002 | 0.02 | | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| VOC 8260 | | | | | | | | | | | | | |
| Styrene | 0.020 | 0.020 | | <0.300-<0.500 | NA | NA | 0.08 | NA | NA | <1 | <1 | <1 | <0.020 |
| SVOC 8270 | 0.200 | 4.00 | | <5.00-<30.0 | NA | NA | <4.00 | NA | NA | <29 | NA | <10 | <0.200 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-7. MODULE TRAIN ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Module Train (SS12)

Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2S04-1 | 2SD02 | | | EB08 | | |
| Laboratory Sample ID Numbers | | | | | 1762 | 1763 | | | 1774 4626-13 | #6-9993 4626 | #5-9693 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L | mg/kg |
| DRPH | 7-25 | 70-250 | 500[a] | <190[b]-150J[b] | <250[b] | <70[b] | | | 289J[cd] | <200-<1,000 | <50 |
| RRPH (Approx.) | 14-50 | 140-500 | 2,000[a] | <180-<670 | <500 | <140 | | | <2,000 | <2,000 | <100 |

- ☐ CT&E Data.
- ▩ F&B Data.
- NA Not analyzed.
- J Result is an estimate.
- a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
- b DRPH concentrations reported for these samples are equivalent to diesel range organics (DRO) as defined by ADEC.
- c This sample was analyzed by F&B also; DRPH were detected at <1,000[b] µg/L.
- d The laboratory reported that the EPH pattern in this sample was not consistent with a middle distillate fuel.

# TABLE 3-7. MODULE TRAIN ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Module Train (SS12)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | 2SW02 | | AB01 | EB01 | EB08 | TB01 | |
| Laboratory Sample ID Numbers | | | | | 508 4355-2 | 1761 | | 906 | 530 534 4357-1 | 1774 1776 4626-13 | 528 4357-8 | #6-9993 #3&4-82593 4355/4357/4626 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | NA | <1,000[b] | | NA | <1,000[b] | 289J[cd] | NA | <200-<1,000 |
| GRPH | 5 | 50 | | <100J[b] | <100J[b] | NA | | <100J[b] | <100J[b] | <20[c] | <100J[b] | <50 |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | NA | <2,000 | | NA | <2,000 | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | NA | | <1 | <1 | <1 | <1 | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | NA | | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | NA | | <1 | <1 | <1 | <1 | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | NA | | <2 | <2 | <2 | <2 | <2 |
| VOC 8260 | | | | | | | | | | | | |
| 1,2-Dichloroethane | 1 | 1 | 5 | 4.9-7.9 | 3.1B | NA | | NA | 3.9 | <1 | <1 | <1 |
| Toluene | 1 | 1 | 1,000 | <1 | 1.6 | NA | | NA | <1 | <1 | <1 | <1 |
| SVOC 8270 | 10 | 11 | | <10.2-<11 | <11 | NA | | NA | <29 | NA | NA | <10 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
B The analyte was detected in the associated blank.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L, respectively.
d The laboratory reported that the EPH pattern in this sample was not consistent with a middle distillate fuel.

# TABLE 3-7. MODULE TRAIN ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Module Train (SS12)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | 2SW02 | | AB01 | EB01 | EB08 | TB01 | |
| Laboratory Sample ID Numbers | | | | | 512<br>514<br>4355-2 | 1761 | | 906 | 530<br>534<br>4357-1 | 1774<br>1776<br>4626-13 | 528<br>4357-8 | 4355<br>4357 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | µg/L | µg/L | µg/L | µg/L | µg/L |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 43,700 | NA | | NA | <5,000 | NA | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | 64,000 | NA | | NA | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 615,000 | NA | | NA | NA | NA | NA | <10,000 |

☐ CT&E Data.
NA Not analyzed.

## TABLE 3-8. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE MODULE TRAIN (SS12)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Module Train (SS12) | Soil | RRPH | 560 | mg/kg | <180-<670 | -- | -- | 2,000[c] | No |
| | | Styrene | 0.08 | mg/kg | <0.300-<0.500 | -- | 5,400 | -- | No |
| | Surface Water | Toluene | 1.6 | µg/L | <1 | -- | 96.5 | 1,000[d] | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 56FR 3526 (30 January 1991).
--- Not applicable.

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## 3.5 HANGAR PAD AREA (SS13)

### 3.5.1 Site Background

This site is located approximately 600 feet west of the Garage (SS09) site and south of the airstrip. It consists of an inactive hangar, surrounding gravel pad area, and a 1,000-gallon POL storage tank on the east side of the hangar. The POL tank has been reported to have been cleaned (Radian 1989b).

Previous sampling, conducted in 1992 by Air Force contractors, detected petroleum hydrocarbons and two BTEX compounds in gravel pad areas at the site. A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 3.5.3.

### 3.5.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at Hangar Pad Area (SS13) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**3.5.2.1 Summary of Samples Collected.** A total of ten samples was collected at the site. These consisted of one soil, six sediment, and three surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Hangar Pad Area (SS13) site are presented in Figure 3-5.

The one soil sample was analyzed for DRPH, GRPH, RRPH, BTEX, and HVOCs.

Six sediment samples were analyzed for DRPH and RRPH. In addition, three samples were analyzed for GRPH, BTEX, and HVOCs. One sample was analyzed for HVOCs, SVOCs, and TOC.

Three surface water samples were analyzed for DRPH, GRPH, RRPH, BTEX, and HVOCs. In addition, one water sample was analyzed for VOCs, SVOCs, TOC, TSS, and TDS.

**3.5.2.2 Analytical Results.** The data summary table (Table 3-9) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 3-5. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil and sediment samples collected at the site include DRPH, GRPH, and RRPH. DRPH, GRPH, and RRPH were detected in sediment sample SS13-SD02 at 190, 40, and 220 mg/kg, respectively.

In surface water samples, organic compounds detected are limited to three BTEX compounds. Toluene and ethylbenzene were detected in surface water sample SS13-SW02 at 3 and 2 μg/L, respectively. Xylenes were detected in two samples at 4 and 18 μg/L (SS13-SW02 and SS13-SW03, respectively).

**Inorganics**. Metals were not a concern at the site, and no metals analyses were performed. TOC was reported at 19,600 mg/kg in sediment sample SS13-SD01, and TOC, TSS, and TDS were reported at 34,600, 8,500, and 846,000 μg/L, respectively, in surface water sample SS13-SW01.

**3.5.2.3 Summary of Site Contamination**. Previous sampling conducted at the Hangar Pad Area (SS13) detected petroleum hydrocarbons (diesel and gasoline range organics), ethylbenzene, and toluene in the soil at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

During previous sampling conducted in 1992, petroleum hydrocarbons (diesel and gasoline range organics) were detected in a soil sample (3,100 and 181 mg/kg, respectively). Ethylbenzene and toluene were detected in soil samples at up to 0.7 and 4.4 mg/kg, respectively.

A comparison of historical and current project data indicates that there is a lower concentration of contaminants in soil than there has been in the past. Maximum concentrations of compounds detected in soil during the 1993 RI include DRPH at 190 mg/kg, GRPH at 40 mg/kg, and RRPH at 220 mg/kg. In addition, low levels of BTEX compounds (2 to 18 mg/kg) were detected in surface water samples. Past and current sample data indicate contamination at the site is not widespread, and only relatively low concentrations were detected. The human health and ecological risks associated with chemicals detected at the site are presented in Section 3.5.4 and 3.5.5. The suspected source of contaminants detected during sampling conducted at the Hangar Pad Area is fuel spills and/or leaks from the 1,000-gallon POL storage tank adjacent to the hangar.

### 3.5.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**3.5.3.1 Topography and Stratigraphy**. The site consists of a gravel pad placed on relatively flat tundra, upon which the hangar building and inactive diesel storage tank have been

constructed. The topography in this area is generally flat. The gravel pad, which is approximately three feet thick, provides the greatest topographic relief at the site. Several small ponds are located in the tundra along the edge of the gravel pad. Drainage is radial, away from the site.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

#### 3.5.3.2 Migration Potential.

**Subsurface Migration**. The site topography indicates that active layer water flow should be very sluggish. It should generally follow the surface contours and flow radially out from the gravel pad to the tundra. Numerous tundra ponds border the gravel pad edge. Contaminated active layer water that flows through the gravel pad will enter these water bodies and no longer present a potential for subsurface migration. However, a potential for surface migration is then created.

Surface water samples from two of the small ponds at the site contained low levels of BTEX. Because these ponds do not have drainage outlets, affected surface water in them may infiltrate into the subsurface and migrate in the active layer. The surrounding topography is flat and marshy and the rate at which subsurface migration could occur is slow. Based upon this, the potential for subsurface migration is considered to be limited.

**Surface Migration**. The primary route of surface migration over the gravel pad is overland sheet flow. Significant surface migration over the gravel pad area is probably restricted to the spring thaw when large quantities of meltwater are available, and the frozen ground prevents active layer water flow. Surface migration on the gravel pad will follow surface contours, which are generally radial from the gravel pad out to the tundra and surface water bodies that border the site.

Bordering the gravel pad to the south and west are tundra areas where surface water migrates through a series of tundra ponds connected by sluggish ephemeral streams. Low levels of BTEX were detected in two surface water samples collected from ponds at this site. Although there are no drainage outlets from water bodies at this site, the surrounding tundra is saturated and the possibility for migration through the marsh exists. Based upon the analytical data and sluggish migration pathway, the potential for contaminant migration is considered to be limited.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Offsite migration of contaminants does not appear to be occurring at the site. Analytical data and site topography indicate that migration of low levels of BTEX has occurred to a very limited degree into two of the adjacent tundra ponds.

### 3.5.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the Hangar Pad Area (SS13) site include Air Force contractor personnel occasionally working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers periodically at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at the site are presented in Section 3.5.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 3.5.5.

### 3.5.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Hangar Pad Area (SS13) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site

chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**3.5.4.1 Chemicals of Concern**. No COCs were selected for the soil/sediment or surface water at the Hangar Pad Area. As a result, no COCs were associated with significant noncancer hazards or cancer risks at the site. This does not indicate that exposure to chemicals in the soil/sediment or surface water at the site is without health risk; however, the concentrations measured were below concentrations considered acceptable under Region 10 guidance (EPA 1991a) or ARARs.

Table 3-10, Identification of COCs at the Hangar Pad Area (SS13), presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs.

**3.5.4.2 Summary of Human Health Risk Assessment**. No COCs were selected for the soil/sediment or surface water matrices at the Hangar Pad Area site. Therefore, no evaluation of cancer risk or noncancer hazard was conducted at the site.

### 3.5.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**3.5.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were identified in surface water or soil/sediment at the site. As a result, no COCs were associated with significant risk estimates at the Hangar Pad Area site.

**3.5.5.2 Summary of Ecological Risk Assessment**. Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Hangar Pad Area site are not significant.

### 3.5.6 Conclusions and Recommendations

Sampling and analyses have determined that there is no significant contamination at the Hangar Pad Area (SS13) site. Only relatively low levels of contaminants were detected. Their source is suspected to be previous spills and/or leaks from the 1,000-gallon POL storage tank west of the hangar. There does not appear to be any significant migration of contaminants from the site based on the sediment samples collected downgradient of the site.

No COCs were identified in the human health or ecological risk assessment for either the soil/sediment or surface water matrices at the site; therefore, the risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. Based on the RI sampling and analyses, risk assessment, and current or future site uses, remedial actions are not warranted at the site. No significant human health or ecological risks were identified at the site. Therefore, the Hangar Pad Area (SS13) site is recommended for no further action.

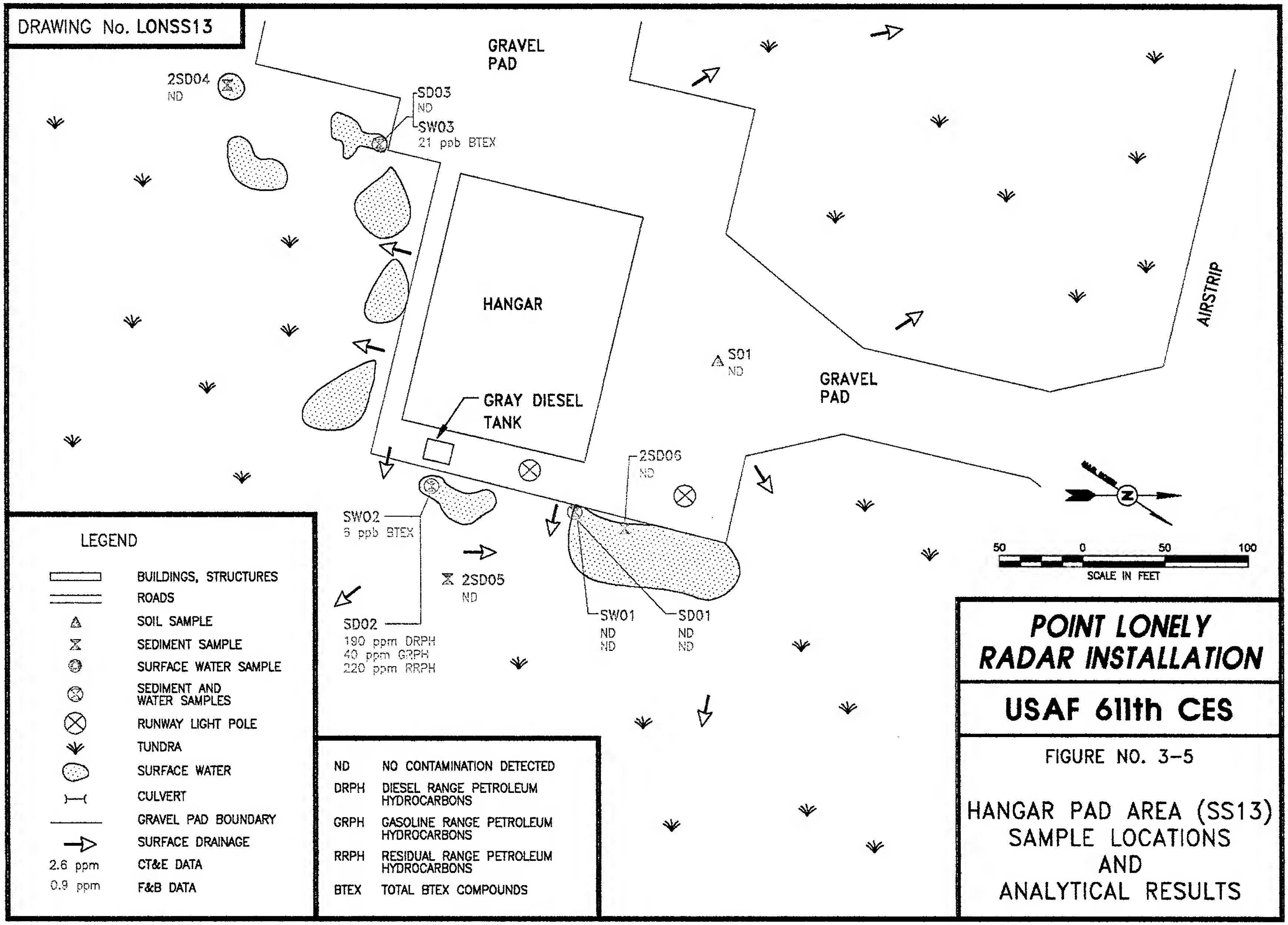


FIGURE NO. 3-5

HANGAR PAD AREA (SS13) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 3-9. HANGAR PAD AREA ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Hangar Pad Area (SS13)
Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | SD01 | SD02 | SD03 | AB02 | EB04 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 1106 | 1104 4429-1 | 1108 | 1102 | 1094 | 1098 1100 4426-4 | 1092 4426-3 | #5-83093 #5-82893 #1&2-82893 4426 | #6-82993 #3&4-83193 #1&2-82893 4429 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-10 | 50-100 | 500[a] | <190[b]-150J[b] | <50[b] | <100[b] | 190J[b] | <80[b] | NA | <1,000J[b] | NA | <1,000 | <50 |
| GRPH | 0.2-0.4 | 2-4 | 100 | <20J[b]-27J[b] | <2J[b] | <4J[b] | 40J[b] | <2J[b] | <50[b] | <50J[b] | <50J[b] | NA | <2 |
| RRPH (Approx.) | 10-19 | 110-190 | 2,000[a] | <180-<670 | <110 | <190 | 220 | <110 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | <0.20 | <0.64 | <0.10 | | | | | |
| Benzene | 0.002-0.02 | 0.02-0.2 | 0.5 | <0.04-<0.3 | <0.02 | <0.04 | <0.2 | <0.02 | <1 | <2J | <6J | <1 | <0.02 |
| Toluene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.5 | <0.02 | <0.04 | <0.2 | <0.02 | <1 | <2J | <4J | <1 | <0.02 |
| Ethylbenzene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.2 | <0.02 | <0.04 | <0.2 | <0.02 | <1 | <2J | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.04 | 0.04-0.4 | | <0.4-2.0J | <0.04 | <0.08 | <0.4 | <0.04 | <2 | <2J | <3J | <2 | <0.04 |
| HVOC 8010 | 0.002-0.004 | 0.02-0.04 | | <0.04-<0.3 | <0.02 | <0.04 | <0.02 | <0.02 | <1 | <1 | <1 | NA | <0.02 |
| VOC 8260 | 0.020 | 0.030 | | <0.04-<0.3 | NA | <0.030 | NA | NA | NA | <1 | <1 | NA | <0.020 |
| SVOC 8270 | 0.200 | 2.70-6.27 | 8,000 | <5.00-<30.0 | NA | <2.7-6.27U | NA | NA | NA | <26 | NA | <10 | <0.200-1.610 |
| TOC | | | | 99,600-473,000 | NA | 19,600 | NA | NA | NA | <5,000 | NA | <5,000 | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-9. HANGAR PAD AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely | Matrix: Sediment
Site: Hangar Pad Area (SS13) | Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2SD04 | 2SD05 | 2SD06 | | | EB08 | | |
| Laboratory Sample ID Numbers | | | | | 1764 | 1765 | 1766 | | | 1774 | #6-9993 | #5-9693 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L | mg/kg |
| DRPH | 6-8 | 60-80 | 500[a] | <190[b]-150J[b] | <80[b] | <80[b] | <60[b] | | | 289J[cd] | <1,000 | <50 |
| RRPH (Approx.) | 12-20 | 120-200 | 2,000[a] | <180-<670 | <200 | <200 | <120 | | | <2,000 | <2,000 | <100 |

- ☐ CT&E Data.
- ▩ F&B Data.
- NA Not analyzed.
- J Result is an estimate.
- a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
- b DRPH concentrations reported for these samples are equivalent to diesel range organics (DRO) as defined by ADEC.
- c This sample analyzed by F&B also; DRPH were detected at <1,000[b] µg/L.
- d The laboratory reported that the EPH pattern for this sample was not consistent with a middle distillate fuel.

# TABLE 3-9. HANGAR PAD AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Hangar Pad Area (SS13)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples SW01 | SW02 | SW03 | | | Field Blanks AB02 | EB04 | TB04 | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | 1110 1112 4429-2 | 1114 1116 | 1118 1120 | | | 1094 | 1098 1110 4426-4 | 1092 4426-3 | #5-83093 #1&2-82893 4429 4426 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | µg/L | µg/L | µg/L | µg/L |
| DRPH | 20 | 200 | | <1,000$^b$ | <1,000J$^b$ | <1,000$^b$ | <1,000J$^b$ | | | NA | <1,000J$^b$ | NA | <1,000 |
| GRPH | 5 | 50 | | <100J$^b$ | <50J$^b$ | <50J$^b$ | <50J$^b$ | | | <50$^b$ | <50J$^b$ | <50J$^b$ | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | | | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | <1 | | | <1 | <2J | <6J | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | 3 | | | <1 | <2J | <4J | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | 2 | <1 | | | <1 | <2J | <3J | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | 4J | 18J | | | <2 | <2J | <3J | <2 |
| HVOC 8010 | 0.1 | 1 | | <1 | <1 | <1 | <1 | | | <1 | <1 | <1 | NA |
| VOC 8260 | 1 | 1 | | <1 | <1 | NA | NA | | | NA | <1 | <1 | <1 |
| SVOC 8270 | 10 | 22 | | <10.2-<11 | <22 | NA | NA | | | NA | <26 | NA | <15 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 34,600 | NA | NA | | | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | 8,500 | NA | NA | | | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 846,000 | NA | NA | | | NA | NA | NA | <10,000 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 3-10. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE HANGAR PAD AREA (SS13)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Hangar Pad Area | Soil or Sediment | DRPH | 190J | mg/kg | <190-150J | -- | -- | 500[c] | No |
| (SS13) | | GRPH | 40J | mg/kg | <20J-27J | -- | -- | 100[c] | No |
| | | RRPH | 220 | mg/kg | <180-<670 | -- | -- | 2,000[c] | No |
| | Surface Water | Toluene | 3 | $\mu g/L$ | <1 | -- | 96.5 | 1,000[d] | No |
| | | Ethylbenzene | 2 | $\mu g/L$ | <1 | -- | 158 | 700[d] | No |
| | | Xylenes (total) | 18J | $\mu g/L$ | <2 | -- | 7,300 | 10,000[d] | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 56 FR 3526 (30 January 1991).
J Result is an estimate.
--- Not applicable.

# 4.0 REMEDIAL INVESTIGATION - REMEDIAL ACTION SITES

This section of the RI/FS presents results from RI sampling and analysis activities for each of the six Point Lonely sites where remedial action may be warranted. The six sites considered for remedial action and discussed in this section are the Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), POL Storage (SS04), Diesel Spills (SS05), and Garage (SS09). Each of the sites is presented individually in Sections 4.1 through 4.6. (Note: figures and tables are presented at the end of each section.) The information presented for each site includes site background, field sampling and analytical results, potential migration pathways, human health and ecological risk assessment summaries, and conclusions and recommendations. The site-by-site discussions in this section are intended to provide the reader with all information needed to understand the site conditions and make decisions regarding appropriate action for each of the sites.

Photographs of the Point Lonely installation and the sites investigated during the RI are presented in Appendix B. Data tables in this section list analytical results from samples in which chemicals were detected above quantitation limits. Complete laboratory analytical data sheets for each sample, including quantitation limits for non-detected analytes, are presented in Appendix F.

## 4.1 SEWAGE DISPOSAL AREA (SS01)

### 4.1.1 Site Background

This site is an old domestic Sewage Disposal Area located on the beach north of the installation and northeast of the Beach Diesel Tanks (SS03) site. The site consists of a beach, gravel road, and tundra on which a pumphouse has been constructed. Two diesel fuel fill pipes, three sewage outfall pipes, and a culvert exist at the site. All diesel fuel lines and sewage outfall pipes are inactive. The western-most diesel fuel pipe leads from the beach, under the road, through the pumphouse, and to the large diesel tank farm (Husky fuel tanks). The eastern diesel fuel fill pipe leads from the beach, below the road, across the tundra, and to the Beach Diesel Tanks. Three inactive sewage outfall pipes and the culvert are located approximately 100 feet east of the Beach Diesel Tanks fuel line and west of the road to the installation.

Previous sampling, conducted in 1990 by Air Force contractors, detected petroleum hydrocarbons (TPH) and BTEX compounds in soil and surface water at the site. A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 4.1.3.

### 4.1.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Sewage Disposal Area site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**4.1.2.1 Summary of Samples Collected**. A total of 28 samples was collected from gravel pads, beach areas, tundra, ponds, and streams at the site. These consisted of 20 soil, 3 sediment, and 5 surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Sewage Disposal Area (SS01) site are presented in Figure 4-1.

Twenty soil samples were analyzed for DRPH and RRPH. In addition, 15 were analyzed for GRPH and BTEX. Two were analyzed for VOCs and SVOCs.

Three sediment samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, one sediment sample was analyzed for VOCs and SVOCs.

Five surface water samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, two surface water samples were analyzed for VOCs, SVOCs, TOC, TSS, and TDS.

**4.1.2.2 Analytical Results**. The data summary table (Table 4-1) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 4-1. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil/sediment samples collected at the site include DRPH, GRPH, BTEX compounds, six other VOCs, and one SVOC. DRPH were detected in ten soil/sediment samples at concentrations ranging from 180 to 16,000 mg/kg. GRPH were detected in eight soil/sediment samples ranging from 80 to 1,000 mg/kg. BTEX (total) were detected in six soil/sediment samples ranging from 0.152 to 49 mg/kg; xylenes were the primary component. Six other VOCs, all common components of gasoline and diesel fuel, were detected at concentrations ranging from 0.037 to 7.82 mg/kg in three soil samples; the primary components were 1,2,4-trimethylbenzene (7.82 mg/kg), 1,3,5-trimethylbenzene (6.89 mg/kg), and naphthalene (6.80 mg/kg). One SVOC, 2-methylnaphthalene, also a common component of diesel fuel, was detected in two soil samples at concentrations of 1.63 and 6.82 mg/kg (SS01-S04-3 and SS01-S15-2, respectively).

In surface water samples, organic compounds detected at the site include BTEX and four other VOCs. BTEX compounds were detected in two surface water samples at concentrations ranging from 1 to 2.2 μg/L; xylenes were the primary component. Three other VOCs were detected in surface water sample SS01-SW01/SW06 at concentrations ranging from 1.1 to 6.6 μg/L. The primary VOC detected was chloromethane (6.6 μg/L).

One other VOC detected in two surface water samples was detected at similar concentrations in the background samples and a field blank. This compound, 1,2-dichloroethane, was detected at 3.4 and 7.7 μg/L in the environmental samples, 4.9 to 7.9 μg/L in the background samples, and 1.3 μg/L in the field blank. These detections are assumed to be the result of field decontamination procedures. The hexane and methanol used in the decontamination procedures may have contained impurities including 1,2-dichloroethane.

**Inorganics**. Metals were not a concern at the site, and no metals analyses were performed. TOC, TSS, and TDS were reported at 69,200, 32,000, and 1,090,000 μg/L, respectively, in surface water sample SS01-SW01/SW06 and at 49,600, 19,000, and 1,030,000 μg/L, respectively, in surface water sample SS01-SW04.

**4.1.2.3 Summary of Site Contamination**. Previous sampling conducted at the Sewage Disposal Area (SS01) detected petroleum hydrocarbons and BTEX compounds in the soil and surface water at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

During previous sampling conducted in 1990, TPH and BTEX (total) were detected in a soil sample at 1,300 and 14 mg/kg, respectively. In the previous surface water sample collected, TPH was detected at 600 μg/L; benzene, toluene, ethylbenzene, and xylenes were detected at 190, 380, 57, and 1,950 μg/L, respectively.

A comparison of historical and current project data indicates that there is a higher concentration of petroleum compounds and BTEX in soil than there has been in the past, but there is a lower concentration of BTEX compounds in surface water. Maximum concentrations of compounds detected in soil during the 1993 RI include DRPH at 16,000 mg/kg, GRPH at 1,000 mg/kg, BTEX (total) at 49 mg/kg, and VOCs and SVOCs commonly associated with gasoline and diesel fuel at 7.82 mg/kg. Compounds detected in surface water during the 1993 RI include BTEX compounds (1 to 2.2 μg/L), and three other VOCs (1.1 to 6.6 μg/L). Differences between past and current data are likely to be a result of more extensive sampling during the 1993 RI. The human health and ecological risks associated with chemicals detected at the site are presented in Section 4.1.4 and 4.1.5. The suspected source of contaminants detected during sampling conducted at the Sewage Disposal Area is fuel spills and/or leaks from the two diesel fuel fill lines and associated pumphouse.

Based on field data, source of contamination, and concentration of contaminants, the contaminated area at the site is limited to approximately 1,209 square feet of tundra and approximately 30,000 square feet of gravel.

### 4.1.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**4.1.3.1 Topography and Stratigraphy**. The site consists of a gravel road placed on relatively flat tundra adjacent to an approximately six feet high beach bluff. The gravel road divides the tundra and the beach. The road is raised approximately two feet above the tundra and drops off approximately six feet to the beach. The beach slopes gently north to the Beaufort Sea. The tundra slopes very gently to the north at the site but is relatively flat. A culvert located at the east end of the site drains water from the tundra to the beach.

The active layer at this site was approximately two feet thick in tundra areas and four feet thick under gravel pads and roads during the 1993 RI. Gravel pad material consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy found at Point Lonely (Section 2.4.4.2). Along the beach surface and subsurface materials consisted of the typical sands, gravels, and fine materials associated with these features.

**4.1.3.2 Migration Potential.**

**Subsurface Migration**. Although the flat and marshy topography indicates that subsurface flow in the area would be sluggish, analytical results indicate that petroleum compounds have migrated in the subsurface downgradient of the pumphouse and diesel fuel fill line valves. The clustering of affected soils in two distinct locations adjacent to the fill pipes and associated pumping facilities indicates that these features are the probable source. The beach bluff will serve to slightly increase the potential rate of active layer water flow in the immediate vicinity. The potential for migration of contaminants in the subsurface is considered moderate to high.

**Surface Migration**. The primary route of surface migration over the tundra is through sluggish ephemeral streams, and the primary route of surface migration over the gravel and beach portions of the site is overland sheet flow. Significant surface migration is probably limited to spring thaw when large quantities of meltwater are available and the frozen ground prevents active layer water flow. The raised gravel road at the site prevents significant surface water migration from the tundra to the beach. Surface water in the tundra will flow east at the edge of the gravel pad to the culvert where it can then flow to the beach. The lack of contaminants in the surface water in the vicinity indicates that the potential for surface migration of contaminants is low.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Analytical data indicate that subsurface soils have been affected in the immediate vicinity of the fill pipes and the associated pump house. The lack of obvious drainage features suggests that little contaminant migration occurs in surface water.

Although the potential for contaminant migration in active layer water exists, the surrounding topography indicates that flow in this area should be relatively sluggish. Analytical data suggest that transport is limited because downgradient soils have not been affected.

#### 4.1.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the Sewage Disposal Area (SS01) site include Air Force contractor personnel periodically working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with, and incidental ingestion of, soil/sediment and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers periodically at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with site chemicals at Point Lonely are presented in Section 4.1.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be affected by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals at detected at the site are presented in Section 4.1.5.

### 4.1.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Sewage Disposal Area (SS01) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the chemicals detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to RBSLs and ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**4.1.4.1 Chemicals of Concern.** DRPH and GRPH were identified as COCs for the soil matrix at the Sewage Disposal Area site. The maximum concentrations of DRPH and GRPH exceeded their background concentrations and the ARAR concentrations for petroleum hydrocarbon contamination of soil (ADEC 1991).

Benzene and chloromethane were identified as COCs for the surface water at the site. Benzene and chloromethane exceeded the background concentrations and the RBSLs based on cancer risk.

Table 4-2, Identification of COCs at the Sewage Disposal Area, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and the COCs selected in the risk evaluation.

**4.1.4.2 Exposure Pathways and Potential Receptors.** Because COCs were identified for soil/sediment and surface water at the site, the potential risks associated with ingestion of soil/sediment and surface water were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**4.1.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** The noncancer hazard associated with the ingestion of soil at the site by a hypothetical native northern adult/child is 0.2, and by a DEW Line worker is 0.006, based on the maximum concentrations of the COCs. The presence of DRPH and GRPH accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of soil or sediment at the site by a hypothetical native northern adult/child is $3 \times 10^{-7}$, and by a DEW Line worker is $7 \times 10^{-9}$, based on the maximum concentration of the carcinogenic COC. The presence of GRPH accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** No COCs were selected for the surface water at the Sewage Disposal Area based on noncancer hazard. This does not indicate that exposure to the surface water is without noncancer effects, but rather that noncancer effects, if any, cannot be quantified.

The excess lifetime cancer risk associated with the ingestion of surface water at the site by a hypothetical native northern adult is $2 \times 10^{-6}$, and by a DEW Line worker is $2 \times 10^{-8}$, based on the maximum concentrations of the COC. The presence of benzene and chloromethane accounts for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**4.1.4.4 Summary of Human Health Risk Assessment**. The potential risks and hazards associated with the soil/sediment at the Sewage Disposal Area site are limited to the low noncancer hazards (hazard indices of 0.2 and 0.006) and the very low cancer risk associated with GRPH. The noncancer hazards are below one and the cancer risk are below the threshold level of $1 \times 10^{-4}$ at which remediation is recommended (EPA 1991c). Both were calculated conservatively based on a potential future residential scenario. Therefore, the noncancer hazards and cancer risks associated with soil/sediment at the site are minimal.

There were no COCs selected for the surface water at the site based on noncancer hazard. The cancer risk for the native adult is $2 \times 10^{-6}$, and for a DEW Line worker is $2 \times 10^{-8}$; neither exceed the $1 \times 10^{-4}$ threshold level. In addition, the potential hazards and risks were calculated assuming the affected surface water would be used as a sole-source water supply for 180 days per year. Based on site-specific information, the chemicals in surface water do not currently pose a health hazard nor are they likely to pose a hazard in the future. The surface water expressions at the site are frozen most of the year; many are only intermittently filled with water during the summer months. The surface water at the site is not known to be used as a water supply now, nor has it been used in the past.

In conclusion, under current or future uses the COCs identified soil/sediment and surface water at the Sewage Disposal Area pose only minimal, if any, potential threat to human health. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 4.1.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**4.1.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered to be potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were identified in surface water at the site. The COCs in soil/sediment at the Sewage Disposal Area were benzene and xylenes. None of the identified COCs were associated with significant ecological risk estimates at the Sewage Disposal Area site.

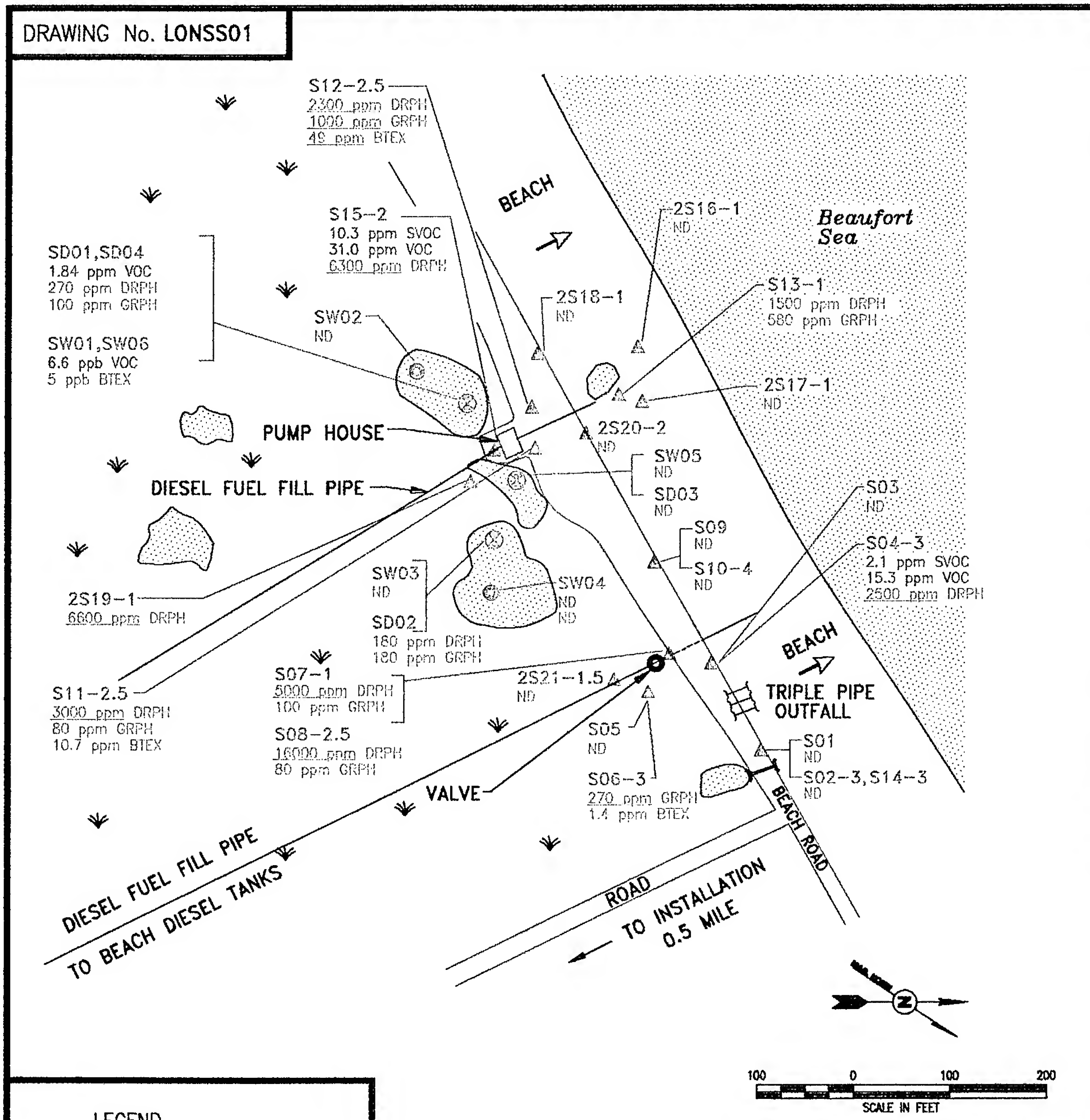
**4.1.5.2 Summary of Ecological Risk Assessment.** Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Sewage Disposal Area site are not significant.

### 4.1.6 Conclusions and Recommendations

Sampling and analyses have determined that the Sewage Disposal Area (SS01) site is contaminated with petroleum compounds (DRPH and GRPH), BTEX, and other VOCs and an SVOC commonly associated with gasoline and diesel fuel. The contaminated media at the site include soil, gravel pad, tundra, and surface water in the vicinity of the two diesel fuel pipes and associated pumphouse. The source of contamination is suspected to be diesel spills and/or leaks associated with the diesel fuel fill pipes and associated pumphouse. Analytical data indicate that limited onsite contaminant migration has occurred in the active layer.

The risk assessment concluded that risks posed to human health or ecological receptors by site contaminants are minimal given current or future site uses. The risks and hazards are based on a conservative future scenario and are not of a magnitude that normally requires remedial action.

Levels of DRPH, GRPH, and BTEX (total) detected in site soil/sediment exceed ADEC guidance cleanup levels, and contaminants appear to be migrating in the subsurface. Therefore, the site is being recommended for remedial action. The contaminated area at the site consists of approximately 3,333 cubic yards of gravel and 90 cubic yards of tundra. The remedial action alternative recommended for all media at the site is passive bioremediation. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.




LEGEND

| | |
|---|---|
| | BUILDINGS, STRUCTURES |
| | ROADS |
| | SOIL SAMPLE |
| | SURFACE WATER SAMPLE |
| | SEDIMENT AND WATER SAMPLES |
| | TUNDRA |
| | SURFACE WATER |
| | SURFACE DRAINAGE |
| | CULVERT |
| | GRAVEL PAD BOUNDARY |
| 2.6 ppm | CT&E DATA |
| 0.9 ppm | F&B DATA |

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| SVOC | TOTAL SEMI-VOLATILE ORGANIC COMPOUNDS |
| VOC | TOTAL VOLATILE ORGANIC COMPOUNDS |
| DRPH | DIESEL RANGE PETROLEUM HYDROCARBONS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 4-1

SEWAGE DISPOSAL AREA (SS01) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY

Installation: Point Lonely    Matrix: Soil
Site: Sewage Disposal Area (SS01)    Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | S02-3 & S14-3 (Replicates) | | S03 | S04-3 | S05 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 852 | 854 | 880 | 858 | 860 4425-1 | 862 | 1094 | 942/944 4425-9 | 916 4425-8 | #5-82893 4425 | #6-82893 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-7 | 50-70 | 500[a] | <190[b]-150J[b] | <50[b] | <50[b] | <50[b] | <50[b] | 2,500J[b] | <70[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-10.9 | 2-109 | 100 | <20J[b]-27J[b] | <20J[b] | <2J[b] | <2J[b] | <2J[b] | <109J[b] | <2J[b] | <50J[b] | <100J[b] | <100J[b] | NA | NA |
| RRPH (Approx.) | 10-14 | 100-140 | 2,000[a] | <180-<670 | <100 | <100 | <100 | <100 | <100 | <140 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <1.0J | <0.1 | <0.1 | <0.1 | <1.0J | <0.1 | | | | | |
| Benzene | 0.002-0.02 | 0.02-0.2 | 0.5 | <0.04-<0.3 | <0.2J | <0.02 | <0.02 | <0.02 | <0.2J | <0.02 | <1 | <1 | <1 | NA | NA |
| Ethylbenzene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.5 | <0.2J | <0.02 | <0.02 | <0.02 | <0.2J | <0.02 | <1 | <1 | <1 | NA | NA |
| Toluene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.2 | <0.2J | <0.02 | <0.02 | <0.02 | <0.2J | <0.02 | <1 | <1 | <1 | NA | NA |
| Xylenes (Total) | 0.004-0.04 | 0.04-0.4 | | <0.4-2.0J | <0.4J | <0.04 | <0.04 | <0.04 | <0.4J | <0.04 | <2 | <2 | <2 | NA | NA |
| VOC 8260 | | | | | | | | | | | | | | | |
| sec-Butylbenzene | 0.020 | 0.200 | | <0.300-0.136 | NA | NA | NA | NA | 0.287 | NA | NA | <1 | <1 | <1 | <0.020 |
| p-Isopropyltoluene | 0.020 | 0.200 | | <0.300-0.107 | NA | NA | NA | NA | 1.120 | NA | NA | <1 | <1 | <1 | <0.020 |
| Naphthalene | 0.020 | 0.200 | | <0.300-0.211 | NA | NA | NA | NA | 2.290 | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,2,4-Trimethylbenzene | 0.020 | 0.200 | | <0.300-0.956 | NA | NA | NA | NA | 5.730 | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,3,5-Trimethylbenzene | 0.020 | 0.200 | | <0.300-0.409 | NA | NA | NA | NA | 4.320 | NA | NA | <1 | <1 | <1 | <0.020 |
| Xylenes (Total) | 0.040 | 0.400 | | <0.600-2.267 | NA | NA | NA | NA | 1.591 | NA | NA | <2 | <2 | <2 | <0.040 |
| SVOC 8270 | | | | | | | | | | | | | | | |
| Naphthalene | 0.200 | 0.230 | | <5.00-<30.0 | NA | NA | NA | NA | 0.485 | NA | NA | <12 | NA | <10 | <0.200 |
| 2-Methylnaphthalene | 0.200 | 0.230 | | <5.00-<30.0 | NA | NA | NA | NA | 1.63 | NA | NA | <12 | NA | <10 | <0.200 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely    Matrix: Soil
Site: Sewage Disposal Area (SS01)    Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S06-3 | S07-1 | S08-2.5 | S09 | S10-4 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 864 | 866 | 868 | 870 | 872 | 1094 | 942<br>944 | 916 | #5-82893 | #6-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-8 | 50-80 | 500[a] | <190[b]-150J[b] | <80[b] | 5,000J[b] | 16,000J[b] | <50[b] | <50[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | 270J[b] | 100J[b] | 80J[b] | <2J[b] | <2J[b] | <50J[b] | <100J[b] | <100J[b] | NA | NA |
| RRPH (Approx.) | 10-15 | 100-150 | 2,000[a] | <180-<670 | <150 | <110 | <110 | <100 | <100 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | 1.4J | <1.6 | <1.4 | <0.1 | <0.1J | | | | | |
| Benzene | 0.002-0.02 | 0.02-0.2 | 0.5 | <0.04-<0.3 | <0.02 | <0.2 | <0.2 | <0.02 | <0.02 | <1 | <1 | <1 | NA | NA |
| Ethylbenzene | 0.002-0.04 | 0.02-0.4 | | <0.2-0.5 | <0.4 | <0.4 | <0.2 | <0.02 | <0.02J | <1 | <1 | <1 | NA | NA |
| Toluene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.2 | 1.4J | <0.2 | <0.2 | <0.02 | <0.02 | <1 | <1 | <1 | NA | NA |
| Xylenes (Total) | 0.004-0.08 | 0.04-0.8 | | <0.4-2.0J | <0.8 | <0.8 | <0.8 | <0.04 | <0.04J | <2 | <2 | <1 | NA | NA |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Sewage Disposal Area (SS01)
Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S11-2.5 | S12-2.5 | S13-1 | S15-2 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 874 | 876 | 878 | 882 4425-4 | 1094 | 4425-9 942 944 | 4425-8 916 | #5-82893 4425 | #6-82893 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-8 | 50-80 | 500[a] | <190[b]-150J[b] | 3,000J[b] | 2,300J[b] | 1,500J[b] | 6,300J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-0.4 | 2-4 | 100 | <20J[b]-27J[b] | 80J[b] | 1,000J[b] | 580J[b] | <4[b] | <50J[b] | <100J[b] | <100J[b] | NA | NA |
| RRPH (Approx.) | 10-17 | 100-170 | 2,000[a] | <180-<670 | <100 | <100 | <140 | <170 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | 10.7J | 49J | <0.1 | <0.20 | | | | | |
| Benzene | 0.002-0.004 | 0.02-0.04 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.04 | <1 | <1 | <1 | NA | NA |
| Ethylbenzene | 0.002-0.004 | 0.02-0.04 | | <0.2-0.5 | 0.7J | 7J | <0.02 | <0.04 | <1 | <1 | <1 | NA | NA |
| Toluene | 0.002-0.004 | 0.02-0.04 | | <0.2-0.2 | <0.2 | 10J | <0.02 | <0.04 | <1 | <1 | <1 | NA | NA |
| Xylenes (Total) | 0.004-0.008 | 0.04-0.08 | | <0.4-2.0J | 10J | 32J | <0.04 | <0.08 | <2 | <2 | <2 | NA | NA |
| VOC 8260 | | | | | | | | | | | | | |
| n-Butylbenzene | 0.020 | 0.400 | | <0.300-0.218 | NA | NA | NA | 3.51J | NA | <1 | <1 | <1 | <0.020 |
| sec-Butylbenzene | 0.020 | 0.400 | | <0.300-0.136 | NA | NA | NA | 0.49J | NA | <1 | <1 | <1 | <0.020 |
| p-Isopropyltoluene | 0.020 | 0.400 | | <0.300-0.107 | NA | NA | NA | 0.931J | NA | <1 | <1 | <1 | <0.020 |
| Naphthalene | 0.020 | 0.400 | | <0.300-0.211 | NA | NA | NA | 6.80J | NA | <1 | <1 | <1 | <0.020 |
| 1,2,4-Trimethylbenzene | 0.020 | 0.400 | | <0.300-0.956 | NA | NA | NA | 7.82J | NA | <1 | <1 | <1 | <0.020 |
| 1,3,5-Trimethylbenzene | 0.020 | 0.400 | | <0.300-0.409 | NA | NA | NA | 6.89J | NA | <1 | <1 | <1 | <0.020 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely Matrix: Soil
Site: Sewage Disposal Area (SS01) Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S11-2.5 | S12-2.5 | S13-1 | S15-2 | AB02 | EB03 | TB03 | | |
| Laboratory Sample ID Numbers | | | | | 874 | 876 | 878 | 882<br>4425-4 | 1094 | 4425-9<br>942<br>944 | 4425-8<br>916 | 4425 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| Xylenes (Total) | 0.040 | 0.800 | | <0.600-2.267 | NA | NA | NA | 4.57J | NA | <2 | <2 | <2 | <0.040 |
| SVOC 8270 | | | | | | | | | | | | | |
| Naphthalene | 0.200 | 3.20 | | <5.00-<30.0 | NA | NA | NA | 3.45 | NA | <12 | NA | <10 | <0.200 |
| 2-Methylnaphthalene | 0.200 | 3.20 | | <5.00-<30.0 | NA | NA | NA | 6.82 | NA | <12 | NA | <10 | <0.200 |

☐ CT&E Data.
NA Not analyzed.
J Result is an estimate.

# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely    Matrix: Soil/Sediment
Site: Sewage Disposal Area (SS01)    Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples: SD01 & SD04 (Replicates) | | SD02 | SD03 | 2S21-1.5 | Field Blanks: AB02 | EB03 | EB05 | TB03 | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | 884 4425-2 | 890 4425-3 | 886 | 888 | 1786 | 1094 | 942 944 4425-9 | 1796 1798 4626-6 | 916 4425-8 | #5-82893 4425 4626 | #6-82893 #3&4-83193 #1&2-83193 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 8-28 | 80-280 | 500$^a$ | <190$^b$-150J$^b$ | 120J$^b$ | 270J$^b$ | 180J$^b$ | <280$^b$ | <80$^b$ | NA | <1,000$^b$ | <200$^c$ | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J$^b$-27J$^b$ | 100J$^b$ | <2$^b$ | 180$^b$ | <2J$^b$ | <2J$^b$ | <50J$^b$ | <100J$^b$ | <20$^c$ | <100J$^b$ | NA | <2 |
| RRPH (Approx.) | 12-14 | 120-140 | 2,000$^a$ | <180-<570 | <120 | <120 | <120 | <120 | <140 | NA | <2,000 | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <2.0 | <2.0 | <2.0 | <2.0 | <0.21 | | | | | | |
| Benzene | 0.003-0.04 | 0.03-0.4 | 0.5 | <0.04-<0.3 | <0.4 | <0.4 | <0.4 | <0.4 | <0.03 | <1 | <1 | <1 | <1 | NA | <0.02 |
| Ethylbenzene | 0.005-0.04 | 0.05-0.4 | | <0.2-0.5 | <0.4 | <0.4 | <0.4 | <0.4 | <0.05 | <1 | <1 | <1 | <1 | NA | <0.02 |
| Toluene | 0.003-0.04 | 0.03-0.4 | | <0.2-0.2 | <0.4 | <0.4 | <0.4 | <0.4 | <0.03 | <1 | <1 | <1 | <1 | NA | <0.02 |
| Xylenes (Total) | 0.01-0.08 | 0.1-0.8 | | <0.4-2.0J | <0.8 | <0.8 | <0.8 | <0.8 | <0.10 | <2 | <2 | <2 | <2 | NA | <0.04 |
| VOC 8260 | | | | | | | | | | | | | | | |
| n-Butylbenzene | 0.020 | 0.030-0.350 | | <0.300-0.218 | <0.350 | 0.372 | NA | NA | NA | NA | <1 | <1 | <1 | <1 | <0.020 |
| p-Isopropyltoluene | 0.020 | 0.030-0.350 | | <0.300-0.107 | <0.350 | 0.037 | NA | NA | NA | NA | <1 | <1 | <1 | <1 | <0.020 |
| Naphthalene | 0.020 | 0.030-0.350 | | <0.300-0.211 | <0.350 | 0.187 | NA | NA | NA | NA | <1 | <1 | <1 | <1 | <0.020 |
| 1,2,4-Trimethylbenzene | 0.020 | 0.030-0.350 | | <0.300-0.956 | <0.350 | 0.313 | NA | NA | NA | NA | <1 | <1 | <1 | <1 | <0.020 |
| 1,3,5-Trimethylbenzene | 0.020 | 0.030-0.350 | | <0.300-0.409 | 0.779 | 0.774 | NA | NA | NA | NA | <1 | <1 | <1 | <1 | <0.020 |
| Xylenes (Total) | 0.040 | 0.060-0.700 | | <0.300-2.267 | <0.700 | 0.152 | NA | NA | NA | NA | <2 | <2 | <2 | <2 | <0.040 |
| SVOC 8270 | 0.200 | 2.50-2.90 | | <5.00-<30.0 | <2.90 | <2.50 | NA | NA | NA | NA | <12 | <12 | NA | <10-<25 | <0.200-<0.500 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and GRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000$^b$ and <50$^b$ µg/L, respectively.

## TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely  Matrix: Soil
Site: Sewage Disposal Area (SS01)  Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2S16-1 | 2S17-1 | 2S18-1 | 2S19-1 | 2S20-2 | EB05 | | |
| Laboratory Sample ID Numbers | | | | | 1780 | 1781 | 1782 | 1783 | 1784 | 1796<br>1798 | #5-82893 | #6-9993 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | $\mu$g/L | $\mu$g/L | mg/kg |
| DRPH | 6-7 | 60-70 | 500[a] | <190[b]-150J[b] | <60[b] | <70[b] | <60[b] | 6,600J[b] | <60[b] | <200[c] | <1,000 | NA |
| RRPH (Approx.) | 12-14 | 120-140 | 2,000[a] | <180-<670 | <120 | <140 | <120 | <140 | <120 | <2,000 | <2,000 | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH concentrations reported for these samples are equivalent to diesel range organics (DRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH were detected at <1,000[b] $\mu$g/L.

# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely Matrix: Surface Water
Site: Sewage Disposal Area (SS01) Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 & (Duplicates) | SW06 | SW02 | SW03 | SW04 | SW05 | AB02 | EB03 | TB03 | |
| Laboratory Sample ID Numbers | | | | | 4430-1 917 918 | 4430-3 937 940 | 921 922 | 925 928 | 4430-2 929 932 | 933 | 1094 | 4425-9 942 944 | 4425-8 916 | #5-82893 4430 4425 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | NA | <1,000[b] | NA | <1,000 |
| GRPH | 10 | 100 | | <100J[b] | <100J[b] | <100J[b] | <100J[b] | <100J[b] | <100J[b] | NA | <50J[b] | <100J[b] | <100J[b] | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | 2 | 1 | <1 | <1 | 1 | NA | <1 | <1 | <1 | NA |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | 1 | <1 | <1 | 1 | NA | <1 | <1 | <1 | NA |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | 1J | <1 | <1 | <1 | NA | <1 | <1 | <1 | NA |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | 2J | <2 | <2 | <2 | NA | <2 | <2 | <2 | NA |
| VOC 8260 | | | | | | | | | | | | | | |
| Chloromethane | 1 | 1 | | <1 | 6.6 | <1 | NA | NA | <1 | NA | NA | <1 | <1 | <1 |
| 1,2-Dichloroethane | 1 | 1 | 5 | 4.9-7.9 | 7.7B | 2.3B | NA | NA | 3.4B | NA | NA | 1.3 | <1 | <1 |
| Naphthalene | 1 | 1 | | <1 | <1 | 1.1 | NA | NA | <1 | NA | NA | <1 | <1 | <1 |
| 1,3,5-Trimethyl-benzene | 1 | 1 | | <1 | <1 | 1.4 | NA | NA | <1 | NA | NA | <1 | <1 | <1 |
| Xylenes (Total) | 2 | 2 | 10,000 | <2 | <2 | 2.2 | NA | NA | <2 | NA | NA | <2 | <2 | <2 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
B The analyte was detected in the associated blank.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-1. SEWAGE DISPOSAL AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely  Matrix: Surface Water
Site: Sewage Disposal Area (SS01)  Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 & (Duplicates) | SW06 | SW02 | SW03 | SW04 | SW05 | AB02 | EB03 | TB03 | |
| Laboratory Sample ID Numbers | | | | | 4430-1<br>917<br>918 | 4430-3<br>937<br>940 | 921<br>922 | 925<br>928 | 4430-2<br>929<br>932 | 933 | 1094 | 4425-9<br>942<br>944 | 4425-8<br>916 | 4430<br>4425 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| SVOC 8270 | 10 | 10 | | <10.2-<11 | <10 | <10 | NA | NA | <10 | NA | NA | <12 | NA | <10-<25 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 64,500 | 69,200 | NA | NA | 49,600 | NA | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 100 | | 5,000-12,000 | 28,000 | 32,000 | NA | NA | 19,000 | NA | NA | NA | NA | <100 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 1,050,000 | 1,090,000 | NA | NA | 1,030,000 | NA | NA | NA | NA | <10,000 |

☐ CT&E Data.
NA Not analyzed.

## TABLE 4-2. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE SEWAGE DISPOSAL AREA (SS01)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Sewage Disposal Area (SS01) | Soil or Sediments | DRPH | 16,000J | mg/kg | <190-150J | -- | -- | 500[c] | **Yes** |
| | | GRPH | 1,000J | mg/kg | <20J-27J | -- | -- | 100[c] | **Yes** |
| | | Toluene | 10J | mg/kg | <0.2-0.2 | -- | 5,400 | -- | No |
| | | Ethylbenzene | 7J | mg/kg | <0.2-0.5 | -- | 2,700 | -- | No |
| | | Xylenes (total) | 32J | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | | p-Isopropyltoluene | 1.120 | mg/kg | <0.300-0.107 | -- | -- | -- | No |
| | | n-Butylbenzene | 3.51J | mg/kg | <0.300-0.218 | -- | -- | -- | No |
| | | sec-Butylbenzene | 0.49J | mg/kg | <0.300-0.136 | -- | -- | -- | No |
| | | Naphthalene | 6.80J | mg/kg | <0.300-0.211 | -- | 100 | -- | No |
| | | 1,2,4-Trimethylbenzene | 7.82J | mg/kg | <0.300-0.956 | -- | -- | -- | No |
| | | 1,3,5-Trimethylbenzene | 6.89J | mg/kg | <0.300-0.409 | -- | -- | -- | No |
| | | 2-Methylnaphthalene | 6.82 | mg/kg | <50-<30 | -- | -- | -- | No |
| | Surface Water | Benzene | 2 | µg/L | <1 | 0.617 | -- | 5[d] | **Yes** |
| | | Toluene | 1 | µg/L | <1 | -- | 96.5 | 1,000[e] | No |
| | | Ethylbenzene | 1J | µg/L | <1 | -- | 158 | 700[e] | No |
| | | Xylenes (total) | 2.2J | µg/L | <2 | -- | 7,300 | 10,000[e] | No |
| | | Chloromethane | 6.6 | µg/L | <1 | 6.54 | -- | -- | **Yes** |
| | | Naphthalene | 1.1 | µg/L | <1 | -- | -- | -- | No |
| | | 1,3,5-Trimethylbenzene | 1.4 | µg/L | <1 | -- | -- | -- | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
e MCL, 56 FR 3526 (30 January 1991).
J Result is an estimate.
--- Not applicable.

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## 4.2 DRUM STORAGE AREA (ST02)

### 4.2.1 Site Background

The Drum Storage Area (ST02) is located to the west of the Sewage Disposal Area access road adjacent to the turn off to the Beach Diesel Tanks (SS03). This site is an approximately 45-feet by 100-feet elongate raised gravel pad. The site was used for temporary storage of drummed products. During the 1993 reconnaissance, this site appeared to be relatively clean except for an approximately three feet diameter stained area located on the southwest corner of the gravel pad.

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 4.2.3.

### 4.2.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Drum Storage Area site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**4.2.2.1 Summary of Samples Collected.** A total of 16 samples was collected during the RI from the gravel pad, ponds, and adjacent tundra at the site. These consisted of 11 soil and 5 surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Drum Storage Area (ST02) site are presented in Figure 4-2.

Eleven soil samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, eight samples were analyzed for HVOC and PCBs. One sample was analyzed for VOCs, SVOCs, and total metals.

Five surface water samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, and PCBs. In addition, one sample was analyzed for VOCs, SVOCs, total and dissolved metals, TOC, TSS, and TDS.

**4.2.2.2 Analytical Results.** The data summary table (Table 4-3) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds and inorganic analytes with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 4-2. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or decontamination procedures. Only metals detected above background levels that exceed an RBSL or ARAR are presented on Figure 4-2. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds and inorganic analytes detected above background levels at the site. A discussion of TOC, TSS, and TDS is included.

**Organics**. Organic compounds detected in soil and sediment samples at the site include DRPH, GRPH, RRPH, BTEX compounds, and one other VOC. DRPH were detected in two soil samples at concentrations of 1,000 and 130 mg/kg (samples ST02-S01-3 and ST02-S08, respectively). GRPH were detected in five soil samples ranging from 6 to 90 mg/kg. RRPH were detected in soil sample ST02-S01-3 at 1,300 mg/kg. BTEX (total) concentrations ranged from 0.1 to 7.28 mg/kg in three soil samples; xylenes were the primary component. One other VOC (tetrachloroethene) was detected at 2 mg/kg in soil sample ST02-S08.

BTEX were detected in one surface water sample, ST02-SW06, at elevated concentrations. The concentrations for other petroleum hydrocarbons (DRPH, GRPH, and RRPH) in this sample were nondetect. Because the concentration of the BTEX (total) exceeds the nondetect values for DRPH and GRPH, it is suspected that this detection is a false positive, possibly due to cross contamination or a sample switched in the field or laboratory. The values for the BTEX compounds detected in this sample are suspected not to represent true site conditions. Benzene, toluene, ethylbenzene, and xylenes were detected at 500, 1,500, 38, and 1,600 mg/kg, respectively, in surface water sample ST02-SW06. To be conservative, however, these BTEX concentrations were used in the risk assessment.

**Inorganics**. In soils, metals analyses indicated that one metal (magnesium) was detected above background levels at the site. Magnesium was detected at 22,000 mg/kg in soil sample ST02-S02.

In surface water samples, one metal (barium) was detected above background concentrations. Barium was detected at 160 $\mu$g/L in surface water sample ST02-SW01. TOC, TSS, and TDS were reported at 29,700, 8,500, and 858,000 $\mu$g/L, respectively, in surface water sample ST02-SW01.

**4.2.2.3 Summary of Site Contamination**. The primary contaminants at the site are petroleum hydrocarbons (DRPH, GRPH, and RRPH) and VOCs (including BTEX) commonly associated with diesel fuel. The suspected source of contaminants detected during sampling conducted at the Drum Storage Area site is spills and/or leaks associated with previous drum storage activities. The BTEX detected in the surface water at the site is assumed to be a false positive due to laboratory or field cross contamination. No previous IRP sampling is known to have been conducted at the site. The human health and ecological risks associated with the chemicals detected at the site are presented in Sections 4.2.4 and 4.2.5. Based on field data, source of contamination, and concentrations of contaminants, the area of affected soil at this site is limited to nine square feet of gravel located in a limited stained area in the southwest corner of the gravel pad.

### 4.2.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**4.2.3.1 Topography and Stratigraphy**. The topography at the site consists of an approximately four-feet-thick gravel pad placed on relatively flat tundra. The gravel pad is adjacent to the intersection of two gravel roads of the same thickness.

During the 1993 RI, permafrost was located at a depth of up to four feet under the gravel pads and at a depth of two feet under tundra areas. Gravel pads consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy found at Point Lonely (Section 2.4.4.2).

**4.2.3.2 Migration Potential.**

**Subsurface Migration**. Analytical data indicate that the subsurface at the site has been affected by petroleum hydrocarbons (DRPH, GRPH, and RRPH) and associated VOCs (BTEX). The primary area affected is a limited amount of the gravel pad located in the southwest corner. Site topography dictates that subsurface flow in this area should be radial away from the gravel pad and then to the northwest.

The lack of drainage features at the site indicates that most drainage occurs in the subsurface, although the lack of significant contamination in subsurface soil samples collected downgradient of the drum storage pad suggests that only minimal subsurface migration of contaminants could have occurred. Based upon this, the potential for subsurface contaminant migration is considered to be low.

**Surface Migration**. The primary route of surface migration over most of the site is overland sheet flow. Significant surface migration over the gravel pad area is probably restricted to the spring thaw when large quantities of meltwater are available and the frozen ground prevents active layer flow. Surface migration on the gravel pad will follow surface contours, which are generally radial from the gravel pad out to the tundra and surface water bodies that border the site. Analytical data indicate that surface migration has occurred at this site. Relatively low levels of petroleum compounds were detected in surface soil samples adjacent to the gravel pad that decrease with distance from the gravel pad.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Analytical results indicate that minimal contaminant migration is occurring in the surface and subsurface water at the site. The topography indicates that any affected active layer water will be sluggish but will generally migrate radially out from the site. Surface water will also migrate radially out from the site. Significant surface migration occurs primarily in spring when large quantities of meltwater are available.

**4.2.3.3 Receptors and Chemical Concentrations at Receptors.**

**Human Receptors**. Potential human receptors at the Drum Storage Area site include Air Force contractor personnel periodically working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could

potentially be exposed to the chemicals detected in soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers periodically at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at Point Lonely are presented in Section 4.2.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 4.2.5.

### 4.2.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Drum Storage Area (ST02) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the chemicals detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**4.2.4.1 Chemicals of Concern**. DRPH and tetrachloroethene were identified as COCs for the soil matrix at the Drum Storage Area. DRPH exceeded the background concentration and

the ARAR concentration for petroleum hydrocarbon contamination of soil. Tetrachloroethene exceeded the background concentration and the RBSLs based on cancer risk.

Benzene and toluene were identified as COCs for surface water at the Drum Storage Area. Benzene exceeded the background concentration, the RBSL based on cancer risk, and the ARAR which is an Maximum Contaminant Level (MCL) promulgated under the federal Safe Drinking Water Act. Toluene exceeded its background concentration, the RBSL based on noncancer hazard, and the ARAR which is an MCL promulgated under the federal Safe Drinking Water Act.

Table 4-4, Identification of COCs at the Drum Storage Area, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and identifies COCs selected in the risk evaluation.

**4.2.4.2 Exposure Pathways and Potential Receptors**. Because COCs were identified for soil/sediment and surface water at the site, the potential risks associated with ingestion of soil/sediment and surface water were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**4.2.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments**. The noncancer hazard associated with the ingestion of soil at the Drum Storage Area by a hypothetical native northern adult/child is 0.2, and by a DEW Line worker is <0.001, based on the maximum concentrations of the COCs. The presence of DRPH and tetrachloroethene accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of soil/sediment at this site by a hypothetical native northern adult/child is $2 \times 10^{-8}$, and by a DEW Line worker is $4 \times 10^{-10}$, based on the maximum concentrations of the COC. The presence of tetrachloroethene accounts entirely for the quantifiable cancer risk for these receptor/pathway combinations.

**Noncancer Hazard and Cancer Risk Associated with Surface Water**. The noncancer hazard associated with the ingestion of surface water at the Drum Storage Area by a hypothetical native northern adult is 0.1, and a DEW Line worker is 0.008, based on the maximum concentration of the COC. The presence of toluene accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of surface water at the site by a hypothetical native northern adult is $2 \times 10^{-4}$, and by a DEW Line worker is $2 \times 10^{-6}$, based on the maximum concentration of the COC. The presence of benzene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**4.2.4.4 Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the soil/sediment at the Drum Storage Area site are the low noncancer hazard (hazard indices of 0.2 and <0.001) and low cancer risk associated with tetrachloroethene. These risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a potential future residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one (EPA 1991c), and on the basis of the risk assessment remediation of the site is not necessarily warranted.

The hazard indices of 0.1 (native adult) and 0.008 (DEW Line worker) are associated with toluene in surface water at the site indicate a minimal noncancer risk. The cancer risk for the native adult is $2 \times 10^{-4}$, and for a DEW Line worker is $2 \times 10^{-6}$. However, the data on which these risks and hazards are calculated are assumed to be false positives due to laboratory or field cross contamination. In addition, the hazards and risks were calculated assuming the affected surface water would be used as a sole-source water supply for 180 days per year. Based on site-specific information, the chemicals in surface water do not currently pose a health hazard nor are they likely to pose a hazard in the future. The surface water expressions at the site are frozen most of the year; many are only intermittently filled with water during the summer months. The surface water at the site is not known to be used as a water supply now, nor has it been used in the past.

In conclusion, under current uses the COCs identified in soil/sediment and surface water at the Drum Storage Area site pose only a minimal, if any, potential threat to human health. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 4.2.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**4.2.5.1 Chemicals of Concern.** COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soil/sediments deeper than 1.5 feet. No COCs were identified in surface water at the site. The COCs in soil/sediment samples at the Drum Storage Area site were benzene and xylenes. None of the identified COCs were associated with significant ecological risk estimates under current conditions at the Drum Storage Area site.

**4.2.5.2 Summary of Ecological Risk Assessment.** Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks under current conditions at the Drum Storage Area site are not significant.

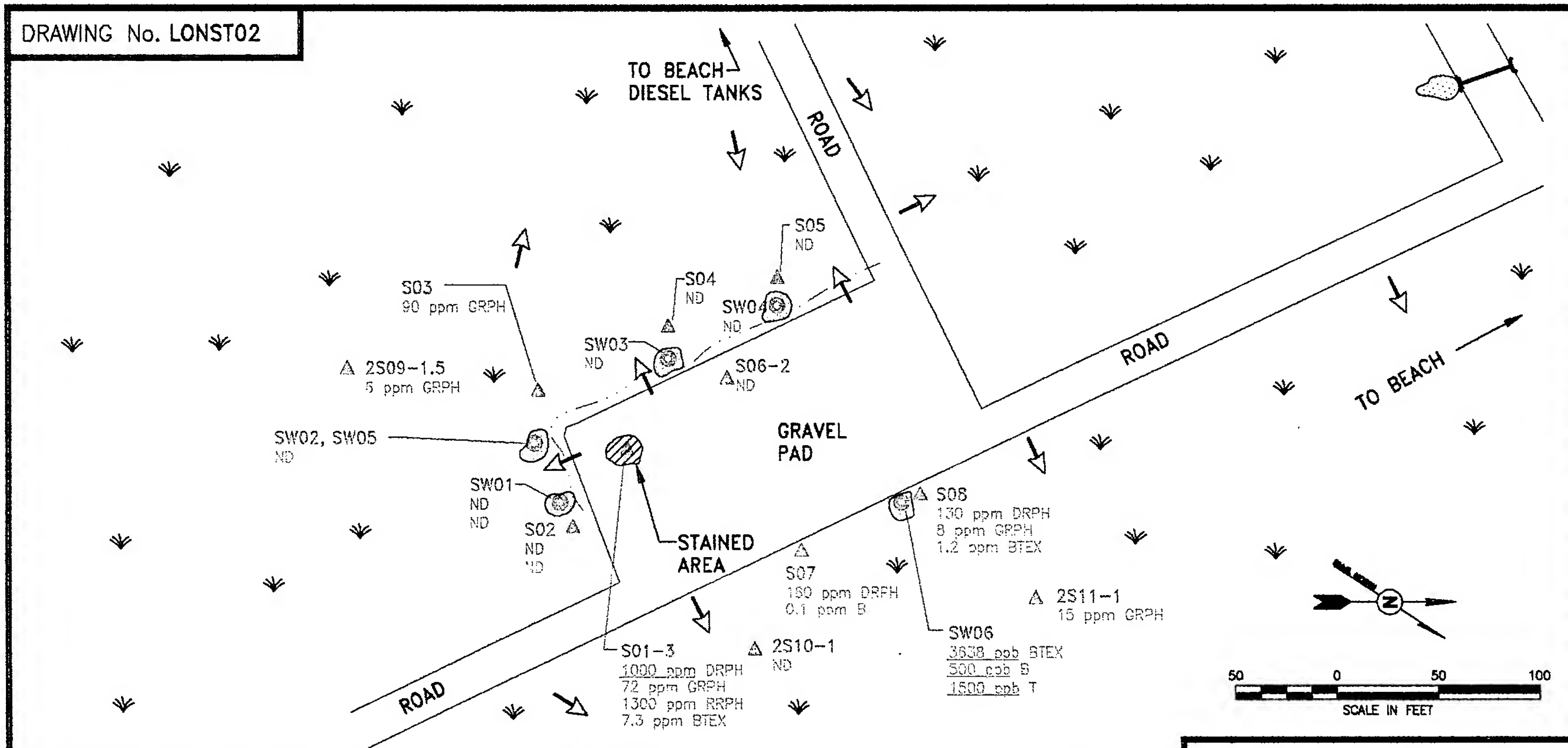
### 4.2.6 Conclusions and Recommendations

Sampling and analyses have determined that the Drum Storage Area (ST02) site is contaminated with petroleum hydrocarbons (DRPH, GRPH, and RRPH) and VOCs (including BTEX) that are components of diesel fuel. The significantly contaminated area at the site is limited to an approximately three feet diameter stained area located on the southwest corner of the gravel pad. This location has the highest petroleum concentrations, which decrease with distance from the stained area of the gravel pad. The suspected source of contamination is previous spills and/or leaks associated with previous drum storage activities conducted at the site. The BTEX detected in surface water at the site is assumed to be a false positive due to laboratory of field cross contamination or an error in sample identification.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current site uses. The human health risk is not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are minimal. Therefore, under current site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of DRPH detected in soil at the site, and the BTEX levels that are assumed to be false positives in surface water, however, exceed ADEC guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected area at the site is approximately one cubic yard of gravel in an approximately 3-feet-diameter area on the southwest corner of the gravel pad. The remedial action alternative recommended for the gravel pad at the site is passive bioremediation. In addition, during remedial action activities, it is recommended that additional water samples be collected to confirm the absence or presence of BTEX compounds in the surface water at the site of where the 1993 RI surface water sample ST02-SW06 was collected. A complete description and evaluation of the remedial alternatives recommended for this site are presented in the FS, Section 5.0.

THIS PAGE INTENTIONALLY LEFT BLANK ANALYTICAL RESULTS




LEGEND

| | |
|---|---|
| | ROADS |
| | SOIL SAMPLE |
| | SURFACE WATER SAMPLE |
| | TUNDRA |
| | SURFACE WATER |
| | CULVERT |
| | GRAVEL PAD BOUNDARY |
| | SURFACE DRAINAGE |
| 2.6 ppm | CT&E DATA |
| 0.9 ppm | F&B DATA |

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| DRPH | DIESEL RANGE PETROLEUM HYDROCARBONS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| RRPH | RESIDUAL RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |
| B | BENZENE |
| T | TOLUENE |

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 4-2

DRUM STORAGE AREA (ST02) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY

Installation: Point Lonely | Site: Drum Storage Area (ST02) | Matrix: Soil | Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01-3 | S02 | S03 | S04 | AB02 | EB03 | EB04 | TB03 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 964 | 962<br>4425-6 | 1032 | 1036 | 1094 | 942/944<br>4425-9 | 1098<br>1100<br>4426-4 | 916<br>4425-8 | 1092<br>4426-3 | #5-83093<br>#5-82893<br>#1&2-82893<br>4425 | #6-82993<br>#6-82893<br>#3&4-83193<br>#1&2-82893<br>4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 6-22 | 60-220 | 500[a] | <180[b]-150J[b] | 1,000J[b] | <60[b] | <220[b] | <140[b] | NA | <1,000[b] | <1,000J[b] | NA | NA | <1,000 | <50 |
| GRPH | 0.2-0.6 | 2-6 | 100 | <20J[b]-27J[b] | 72J[b] | <2J[b] | 90J[b] | <6J[b] | <50J[b] | <100J[b] | <50J[b] | <100J[b] | <50J[b] | NA | <2 |
| RRPH (Approx.) | 12-43 | 120-430 | 2,000[a] | <180-<670 | 1,300 | <120 | <430 | <280 | NA | <2,000 | <2,000 | NA | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | 7.28J | <0.10 | <4.0 | <0.29 | | | | | | | |
| Benzene | 0.002-0.08 | 0.02-0.8 | 0.5 | <0.04-<0.3 | <0.03 | <0.02 | <0.8 | <0.06 | <1 | <1 | <2J | <1 | <6J | <1 | <0.02 |
| Toluene | 0.002-0.08 | 0.02-0.8 | | <0.2-0.5 | 0.08J | <0.02 | <0.8 | <0.08 | <1 | <1 | <2J | <1 | <4J | <1 | <0.02 |
| Ethylbenzene | 0.002-0.08 | 0.02-0.8 | | <0.2-0.2 | 0.9J | <0.02 | <0.8 | <0.06 | <1 | <1 | <2J | <1 | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.16 | 0.04-1.6 | | <0.4-2.0J | 6.3J | <0.04 | <1.6 | <0.11 | <2 | <2 | <2J | <2 | <3J | <2 | <0.04 |
| HVOC 8010 | 0.002-0.008 | 0.02-0.08 | | <0.04-<0.3 | <0.02-<0.03 | <0.02 | <0.08 | <0.08 | <1 | <1 | <1 | <1 | <1 | NA | <0.02 |
| VOC 8260 | 0.020 | 0.020 | | <0.300-<0.500 | NA | <0.020J | NA | NA | NA | <1-1.3 | <1 | <1 | <1 | <1 | <0.020 |
| SVOC 8270 | 0.200 | 0.220-1.01 | | <5.00-<30.0 | NA | <0.220-1.01U | NA | NA | <0.500 | <12 | <26 | NA | NA | <10-<25 | <0.200-<0.500 |
| PCBs | 0.01-0.04 | 0.1-0.4 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.4 | <0.3 | NA | <2 | <2 | NA | NA | <2 | <0.1 |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Drum Storage Area (ST02)
Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S05 | S06-2 | S07 | S08 | AB02 | EB04 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 1038 | 1040 | 1042 | 1044 | 1094 | 1098<br>1100 | 1092 | #5-83093<br>#1&2-82893 | #6-82993<br>#3&4-83193<br>#1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-16 | 50-160 | 500[a] | <190[b]-150J[b] | <50[b] | <50[b] | <160J[b] | 130J[b] | NA | <1,000J[b] | NA | <1,000 | <50 |
| GRPH | 0.2-0.4 | 2-4 | 100 | <20J[b]-27J[b] | <2J[b] | <2J[b] | <4J[b] | 8J[b] | <50J[b] | <50J[b] | <50J[b] | NA | <2 |
| RRPH (Approx.) | 10-19 | 100-190 | 2,000[a] | <180-670[b] | <110 | <100 | <190 | <130 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <0.10 | <0.10 | 0.1J | 1.23J | | | | | |
| Benzene | 0.002-0.004 | 0.02-0.04 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | 0.1J | 0.05J | <1 | <2J | <6J | <1 | <0.02 |
| Toluene | 0.002-0.004 | 0.02-0.04 | | <0.2-0.5 | <0.02 | <0.02 | <0.04 | 0.4J | <1 | <2J | <4J | <1 | <0.02 |
| Ethylbenzene | 0.002-0.004 | 0.02-0.04 | | <0.2-0.2 | <0.02 | <0.02 | <0.04 | 0.08J | <1 | <2J | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.008 | 0.04-0.08 | | <0.4-2.0J | <0.04 | <0.04 | <0.08 | 0.7J | <2 | <2J | <3J | <2 | <0.04 |
| HVOC 8010 | | | | | | | | | | | | | |
| Tetrachloroethene | 0.002-0.004 | 0.02-0.04 | | <0.04-<0.3 | <0.02 | <0.02 | <0.04 | 2J | <1 | <1 | <1 | NA | <0.02 |
| PCBs | 0.01-0.02 | 0.1-0.2 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.2 | <0.1 | NA | <2 | NA | NA | <0.1 |

▒ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely    Matrix: Soil
Site: Drum Storage Area (ST02)    Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples 2S09-1.5 | Environmental Samples 2S10-1 | Environmental Samples 2S11-1 | Field Blank EB05 | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | 1800 | 1802 | 1804 | 1796/1798 4626-6 | #6-9993 #1&2-9793 4626 | #1&2-9793 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | mg/kg |
| DRPH | 7-27 | 70-270 | 500[a] | <190[b]-150J[b] | <270[b] | <70[b] | <70[b] | <200[c] | <200 | NA |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | 6J[b] | <2J[b] | 15[b] | <20[c] | <20 | <1 |
| RRPH (Approx.) | 20-53 | 200-530 | 2,000[a] | <180-<670 | <530 | <200 | <200 | <2,000 | <2,000 | NA |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <0.7 | <0.21 | <1.11 | | | |
| Benzene | 0.003-0.01 | 0.03-0.1 | 0.5 | <0.04-<0.3 | <0.1 | <0.03 | <0.03 | <1 | <1 | <0.02 |
| Toluene | 0.003-0.01 | 0.03-0.1 | | <0.2-0.5 | <0.1 | <0.03 | <0.03 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.005-0.02 | 0.05-0.2 | | <0.2-0.2 | <0.2 | <0.05 | <0.05 | <1 | <1 | <0.02-<0.03 |
| Xylenes (Total) | 0.01-0.1 | 0.1-1 | | <0.4-2.0J | <0.3 | <0.1 | <1J | <2 | <2 | <0.04-<0.09 |
| HVOC 8010 | 0.03-0.1 | 0.3-1 | | <0.04-<0.3 | <1 | <0.3 | <0.3 | <1 | <1-<10 | <0.04-<0.2 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L, respectively.

## TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Drum Storage Area (ST02)

Matrix: Soil
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S02 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4425-6 | | | | | 4425-9 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | | | µg/L | µg/L |
| Aluminum | 0.35 | 2 | | 1,500-25,000 | 3,000 | | | | | <100 | <100 |
| Antimony | N/A | 54 | | <7.8-<230 | <54 | | | | | <100 | <100 |
| Arsenic | 0.11 | 54 | | <4.9-8.5 | <54 | | | | | <100 | <100 |
| Barium | 0.024 | 1 | | 27-390 | 92 | | | | | <50 | <50 |
| Beryllium | N/A | 2.7 | | <2.6-6.4 | <2.7 | | | | | <50 | <50 |
| Cadmium | 0.33 | 2.7 | | <3.0-<36 | <2.7 | | | | | <50 | <50 |
| Calcium | 0.69 | 4 | | 360-59,000 | 38,000J | | | | | 250 | <200 |
| Chromium | 0.066 | 1 | | <4.3-47 | 3 | | | | | <50 | <50 |
| Cobalt | N/A | 5.4 | | <5.1-12 | <5.4 | | | | | <100 | <100 |
| Copper | 0.45 | 27 | | <2.7-45 | <27 | | | | | <50 | <50 |
| Iron | 0.50 | 2 | | 5,400-35,000 | 10,000 | | | | | <100 | <100 |
| Lead | 0.13 | 54 | | <5.1-22 | <54 | | | | | <100 | <100 |
| Magnesium | 0.96 | 4 | | 360-7,400 | 22,000J | | | | | <200 | <200 |
| Manganese | 0.025 | 1 | | 25-290 | 110 | | | | | <50 | <50 |
| Molybdenum | N/A | 2.7 | | <2.5-<11 | <2.7 | | | | | <50 | <50 |
| Nickel | 0.11 | 1 | | 4.2-46 | 5.1 | | | | | <50 | <50 |
| Potassium | 23 | 100 | | <300-2,200 | 460 | | | | | <5,000 | <5,000 |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

# TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Drum Storage Area (ST02)
Matrix: Soil
Units: mg/kg
METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S02 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4425-6 | | | | | 4425-9 | 4425 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | | | µg/L | µg/L |
| Selenium | 1.2 | 54 | | <7.8-<170 | <54 | | | | | <100 | <100 |
| Silver | 0.53 | 1 | | <3-<110 | <27R | | | | | <50 | <50 |
| Sodium | 0.55 | 5 | | <160-680 | 280 | | | | | 420J | <250 |
| Thallium | 0.011 | 0.57 | | <0.2-<1.2 | <0.27 | | | | | <5 | <5 |
| Vanadium | 0.036 | 1 | | 6.3-59 | 22 | | | | | <50 | <50 |
| Zinc | 0.16 | 1 | | 9.2-95 | 13 | | | | | <50 | <50 |

☐ CT&E Data.
J Result is an estimate.
R Result has been rejected.

# TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Drum Storage Area (ST02)
Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | | Field Blanks | | | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 & SW05 (Duplicates) | | SW03 | SW04 | SW06 | AB02 | EB03 | EB04 | TB03 | TB04 | |
| Laboratory Sample ID Numbers | | | | | 972<br>978<br>4423-1 | 1062<br>1064 | 1077<br>1078<br>1080 | 1068<br>1070 | 1072<br>1074 | 1082<br>1084 | 1094 | 942<br>944<br>4425-9 | 1098<br>1100 | 916<br>4425-8 | 1092 | #5-83093<br>#5-82893<br>4423 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000[b] | <1,000J[b] | <1,000[b] | <1,000J[b] | <1,000J[b] | <1,000J[b] | NA | <1,000[b] | <1,000J[b] | NA | NA | <1,000 |
| GRPH | 5-10 | 50-100 | | <100J[b] | <100J[b] | <50J[b] | <50J[b] | <50J[b] | <50J[b] | <50J[b] | <50J[b] | <100[b] | <50J[b] | <100J[b] | <60J[b] | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | NA | <2,000 | <2,000 | NA | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | <1 | <1 | <1 | 500J | <1 | <1 | <2J | <1 | <6J | NA |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | <1 | <1 | <1 | 1,500J[c] | <1 | <1 | <2J | <1 | <4J | NA |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | <1 | <1 | <1 | 38 | <1 | <1 | <2J | <1 | <3J | NA |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | <2 | <2 | <2 | <2 | 1,600J[c] | <2 | <2 | <2J | <2 | <3J | NA |
| HVOC 8010 | 0.1 | 1 | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | NA | <1 | <1 | <1 | <1 | NA |
| VOC 8260 | | | | | | | | | | | | | | | | |
| 1,2-Dichloroethane | 1 | 1 | 5 | 4.9-7.9 | 1.9B | NA | NA | NA | NA | NA | NA | 1.3 | <1 | <1 | <1 | <1 |
| SVOC 8270 | 10 | 30 | | <10.2-<11 | <30 | NA | NA | NA | NA | NA | NA | <12 | <26 | NA | NA | <10-<25 |
| PCBs | 0.2 | 2 | 0.5 | <2 | <2 | <2J | <2 | <2J | <2J | <2J | NA | <2 | <2 | NA | NA | <5 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 29,700 | NA | NA | NA | NA | NA | NA | <5,000 | <5,000 | NA | NA | <5,000 |
| TSS | 100 | 100 | | 5,000-12,000 | 8,500 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <100 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 858,000 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <10,000 |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
B The analyte was detected in the associated blank.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c Results outside calibration range.

# TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Drum Storage Area (ST02)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL
(DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4423-1 | | | | | 4425-9 | 4425<br>4423 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Aluminum | 17.4 | 100 | | <100-350<br>(100-340) | <100<br>(<100) | | | | | <100 | <100 |
| Antimony | N/A | 100 | 6 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Arsenic | 5.3 | 100 | 50 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Barium | 1.2 | 50 | 2,000 | <50-93<br>(50-91) | 160<br>(160) | | | | | <50 | <50 |
| Beryllium | N/A | 50 | 4 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Cadmium | 1.7 | 50 | 5 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Calcium | 34.5 | 200 | | 4,500-88,000<br>(4,100-86,000) | 57,000<br>(56,000) | | | | | 250 | <200 |
| Chromium | 3.29 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Cobalt | N/A | 100 | | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Copper | 2.3 | 50 | 1,300 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Iron | 25 | 100 | | 180-2,800<br>(<100-1,600) | 380<br>(180) | | | | | <100 | <100 |

☐ CT&E Data.
N/A Not available

## TABLE 4-3. DRUM STORAGE AREA ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Drum Storage Area (ST02)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL (DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | | EB03 | |
| Laboratory Sample ID Numbers | | | | | 4423-1 | | | | | 4425-9 | 4425<br>4423 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Lead | 6.6 | 100 | 15 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Magnesium | 47.8 | 200 | | <5,000-53,000<br>(2,600-54,000) | 48,000<br>(50,000J) | | | | | <200 | <200 |
| Manganese | 1.24 | 50 | | <50-510<br>(<50-120) | 55<br>(<50) | | | | | <50 | <50 |
| Molybdenum | N/A | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Nickel | 5.5 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Potassium | 1,154 | 5,000 | | <5,000<br>(<5,000) | <5,000<br>(<5,000) | | | | | <5,000 | <5,000 |
| Selenium | 62.4 | 100 | 50 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Silver | 2.6 | 50 | 50 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Sodium | 27.7 | 250 | | 8,400-410,000<br>(8,200-450,000) | 110,000J<br>(130,000) | | | | | 420 | <250 |
| Thallium | 0.57 | 5 | 2 | <5<br>(<5) | <5<br>(<5) | | | | | <5 | <5 |
| Vanadium | 1.8 | 50 | | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Zinc | 8.2 | 50 | | <50-160<br>(<50) | <50<br>(<50) | | | | | <50 | 1,631 |

☐ CT&E Data.
N/A Not available

## TABLE 4-4. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE DRUM STORAGE AREA (ST02)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] CANCER | RBSL[a] NON-CANCER | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| Drum Storage Area (ST02) | Soil | DRPH | 1,000J | mg/kg | <190-150J | -- | -- | 500[c] | **Yes** |
| | | GRPH | 90J | mg/kg | <20J-27J | -- | -- | 100[c] | No |
| | | RRPH | 1,300 | mg/kg | <180-<670 | -- | -- | 2,000[c] | No |
| | | Benzene | 0.1J | mg/kg | <0.04-<0.5 | 2.2 | -- | 0.5[c] | No |
| | | Toluene | 0.4J | mg/kg | <0.2-0.5 | -- | 5,400 | -- | No |
| | | Ethylbenzene | 0.9J | mg/kg | <0.2-0.2 | -- | 2,700 | -- | No |
| | | Xylenes (total) | 6.3J | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | | Tetrachloroethene | 2J | mg/kg | <0.04-<0.5 | 1.23 | 270 | -- | **Yes** |
| | | Aluminum | 3,000 | mg/kg | 1,500-25,000 | -- | -- | -- | No |
| | | Barium | 92 | mg/kg | 27-390 | -- | 1,890 | -- | No |
| | | Calcium | 38,000J | mg/kg | 360-59,000 | -- | -- | -- | No |
| | | Chromium | 3 | mg/kg | <4.3-47 | -- | 135 | -- | No |
| | | Iron | 10,000 | mg/kg | 5,400-35,000 | -- | -- | -- | No |
| | | Magnesium | 22,000J | mg/kg | 360-7,400 | -- | -- | -- | No |
| | | Manganese | 110 | mg/kg | 25-290 | -- | 3,780 | -- | No |
| | | Nickel | 5.1 | mg/kg | 4.2-46 | -- | 540 | -- | No |
| | | Potassium | 460 | mg/kg | <300-2,200 | -- | -- | -- | No |
| | | Sodium | 280 | mg/kg | <160-680 | -- | -- | -- | No |
| | | Vanadium | 22 | mg/kg | 6.3-59 | -- | 189 | -- | No |
| | | Zinc | 13 | mg/kg | 9.2-95 | -- | 8,100 | -- | No |
| | Surface Water | Benzene | 500J | µg/L | <1 | 0.617 | -- | 5[d] | **Yes** |
| | | Toluene | 1,500J | µg/L | <1 | -- | 96.5 | 1,000[e] | **Yes** |
| | | Ethylbenzene | 38 | µg/L | <1 | -- | 158 | 700[e] | No |

## TABLE 4-4. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE DRUM STORAGE AREA (ST02) (CONTINUED)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Drum Storage Area | Surface Water | Xylenes (total) | 1,600J | µg/L | <2 | -- | 7,300 | 10,000[e] | No |
| (ST02) | (Continued) | Barium | 160 | µg/L | <50-93 | -- | 256 | 2,000[f] | No |
| (Continued) | | Calcium | 57,000 | µg/L | 4,500-88,000 | -- | -- | -- | No |
| | | Iron | 380 | µg/L | 180-2,800 | -- | -- | -- | No |
| | | Magnesium | 48,000 | µg/L | <5,000-53,000 | -- | -- | -- | No |
| | | Manganese | 55 | µg/L | <50-510 | -- | 18.3 | -- | No |
| | | Sodium | 110,000J | µg/L | 8,400-410,000 | -- | -- | -- | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
e MCL, 56 FR 3526 (30 January 1991).
f MCL, 56 FR 30266 (01 January 1991).
J Result is an estimate.
--- Not applicable.

## 4.3 BEACH DIESEL TANKS (SS03)

### 4.3.1 Site Background

This site is located near the beach northwest of the main installation facilities. The site is approximately 250 feet west of the Drum Storage Area and the road leading to the beach. It consists of two diesel tanks and associated piping situated in a bermed enclosure on a gravel pad. The inactive tanks were reportedly cleaned during installation closure activities in 1989. The lined berm around the tanks was breached during closure activities to ensure that water did not fill the bermed area.

Previous sampling, conducted in 1990 by Air Force contractors, detected low levels of petroleum hydrocarbons (TPH) in soil at the site. A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 4.3.3.

### 4.3.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Beach Diesel Tanks (SS03) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**4.3.2.1 Summary of Samples Collected.** A total of nine samples was collected at the site. These consisted of five soil, two sediment, and two surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Beach Diesel Tanks (SS03) site are presented in Figure 4-3.

Five soil samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, one soil sample was analyzed for HVOCs, VOCs, and SVOCs.

Two sediment samples were analyzed for DRPH, GRPH, RRPH, and BTEX.

Two surface water samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, one surface water sample was analyzed for VOCs, SVOCs, TOC, TSS, and TDS.

**4.3.2.2 Analytical Results**. The data summary table (Table 4-6) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 4-3. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil/sediment samples collected at the site include DRPH, GRPH, BTEX compounds, and three VOCs commonly associated with diesel fuel. DRPH and GRPH were detected in one soil sample location (duplicate samples SS03-2S06/2S07) at 15,200 and 150 mg/kg, respectively. BTEX were detected in two soil samples at 0.149 and 1.6 mg/kg (samples SS03-S01 and SS03-2S06/2S07, respectively); xylenes were the primary component. Three other VOCs that are common components of diesel fuel (naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene) were detected at very low concentrations in soil sample SS03-S01 (0.039, 0.174, and 0.071 mg/kg, respectively).

No organic compounds were detected in surface water samples collected at the site.

**Inorganics**. Metals were not a concern at the site, and no metals analyses were performed.

TOC, TSS, and TDS were reported at 43,600, 18,000, and 1,430,000 µg/L, respectively, in surface water sample SS03-SW01.

**4.3.2.3 Summary of Site Contamination**. Previous sampling conducted at the Beach Diesel Tanks (SS03) detected petroleum compounds (TPH) at 72 mg/kg in a soil sample collected outside the berm at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

A comparison of historical and current project data indicates that there is a lower concentration of petroleum compounds in soil than there has been in the past. No contaminants were detected outside of the bermed area during the 1993 RI. Compounds were detected inside the berm in a small stained area below pipes located between the diesel tanks. Compounds detected in soil during the 1993 RI include DRPH (15,200 mg/kg), GRPH (150 mg/kg), BTEX (1.6 mg/kg) and very low levels of three other VOCs that are common components of diesel fuel. The human health and ecological risks associated with chemicals detected at the site are presented in Section 4.3.4 and 4.3.5. The suspected source of contaminants detected during sampling conducted at the Beach Diesel Tanks is fuel spills and/or leaks from the piping associated with the Beach Diesel Tanks.

Based on field data, source of contamination, and concentration of contaminants, the contaminated area at the site is limited to approximately 525 square feet of gravel located in a stained area between the diesel tanks.

### 4.3.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**4.3.3.1 Topography and Stratigraphy**. The topography at the site is relatively flat; man-made gravel pads and berms provide the greatest topographic relief. The site consists of an approximately four-feet-thick gravel pad surrounded by a three-foot gravel berm placed on relatively flat tundra. The gravel pad is located at the southwest end of a gravel road. The gravel berm slopes at the angle of repose down approximately seven feet to the tundra and is lined. The southeast berm wall was breached in 1989 when the station was deactivated.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

**4.3.3.2 Migration Potential.**

**Subsurface Migration**. Subsurface migration in the gravel bermed area is constrained by the berm liner, and topography suggest that active layer water will flow to the southeast through the breach in the berm out to the tundra. No contaminants were detected in samples collected in the tundra, and the potential for contaminant migration in the subsurface is considered low.

**Surface Migration**. Surface migration from inside the bermed area will flow out the breach in the berm southeast to the tundra. No analytes were detected in surface water or sediment samples outside of the berm. There are no other obvious drainage features at the site. Significant surface drainage is probably restricted to the spring thaw, when abundant melt water and reduced infiltration may create overland flow conditions. The lack of contaminants detected in surface water and sediment samples from this site suggest that the potential for surface migration of organic contaminants is remote.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Although contaminated soils are present near the center of the gravel pad, the lack of contaminants in surrounding surface water, soil, and sediment samples suggests that significant migration has not occurred from this site. Contaminants were not detected outside the breach in the berm. Because the surrounding terrain is flat, marshy, and without other obvious drainage features, the potential for significant surface or subsurface migration from this site is considered to be minimal.

**4.3.3.3 Receptors and Chemical Concentrations at Receptors.**

**Human Receptors**. Potential human receptors at the Beach Diesel Tanks (SS03) site include Air Force contractor personnel periodically working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, and incidental ingestion of soil/sediment. Surface water was not considered a route of exposure at the site because no chemicals were detected in surface water samples collected at the site.

Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at the site are presented in Section 4.3.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 4.3.5.

### 4.3.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Beach Diesel Tanks (SS03) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**4.3.4.1 Chemicals of Concern**. DRPH and GRPH were identified as COCs for the soil matrix at the Beach Diesel Tanks site. The maximum concentrations of DRPH and GRPH exceeded their background concentrations and the ARAR concentrations for petroleum hydrocarbon contamination of soil.

No COCs were identified for the surface water at the Beach Diesel Tank site because no chemicals were detected in surface water samples collected from the site.

Table 4-6, Identification of COCs at the Beach Diesel Tanks, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and the COCs selected in the risk evaluation.

**4.3.4.2 Exposure Pathways and Potential Receptors.** Because no COCs were identified for surface water at the site, only soil/sediment ingestion pathways were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**4.3.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** The noncancer hazard associated with the ingestion of soil at the Beach Diesel Tanks by a hypothetical native northern adult/child is 0.2, and by a DEW Line worker is 0.005, based on the maximum concentrations of the COCs. The presence of DRPH and GRPH accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of soil or sediment at the site by a hypothetical native northern adult/child is $4 \times 10^{-8}$, and by a DEW Line worker is $1 \times 10^{-9}$, based on the maximum concentration of the carcinogenic COC. The presence of GRPH accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** No COC was identified for the surface water at the Beach Diesel Tanks site. This does not indicate that exposure to chemicals in the surface water at the site is without health risk; however, no chemicals were measured at concentrations that exceeded the detection limits of the surface water analyses.

**Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the soil/sediment at the Beach Diesel Tanks are the low noncancer hazard (hazard indices of 0.2 and 0.005) and the very low cancer risk associated with GRPH. These risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a potential future residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one (EPA 1991c), and on the basis of the risk assessment remediation of the site is not warranted.

In conclusion, under current uses, the COCs identified in soil/sediment at the Beach Diesel Tanks (SS03) site pose only a minimal, if any, potential threat to human health. The cancer risks and noncancer hazards calculated for soil/sediment at the site are below levels at which remediation

is usually required. No COCs were identified in surface water at the site. Based on the human health risk assessment, remedial actions are not warranted at the site.

#### 4.3.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**4.3.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were identified in surface water at the site. The COCs in soils/sediments at the Beach Diesel Tanks site were DRPH, GRPH, and xylenes. None of the identified COCs were associated with significant risk estimates at the Beach Diesel Tanks site.

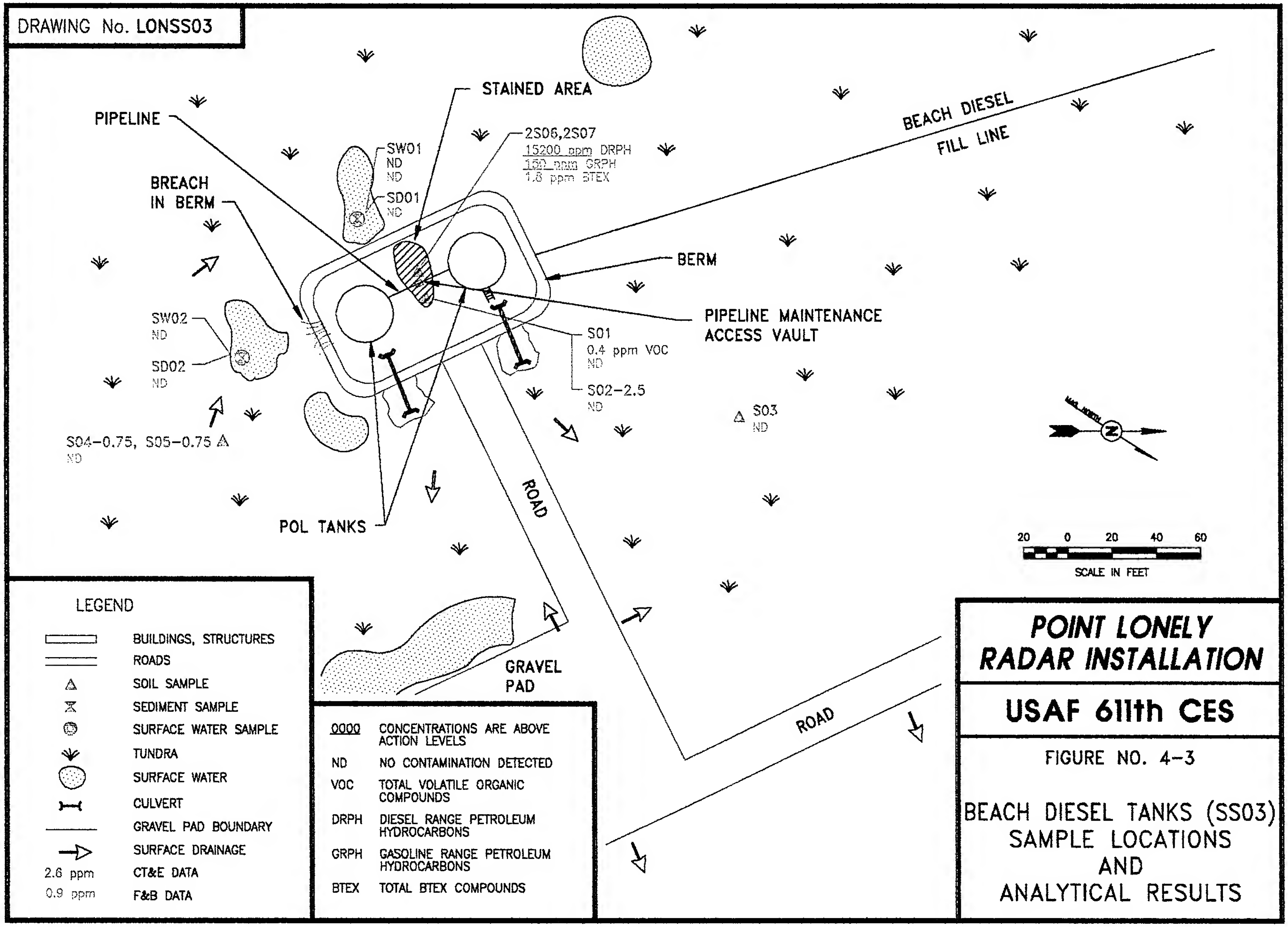
**4.3.5.2 Summary of Ecological Risk Assessment**. Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Beach Diesel Tanks site are not significant.

#### 4.3.6 Conclusions and Recommendations

Sampling and analyses have determined that the Beach Diesel Tanks (SS03) site is contaminated with petroleum hydrocarbons (DRPH and GRPH) and VOCs (including BTEX) that are primarily associated with diesel fuels. The affected area at the site is limited to an approximately 30-feet by 15-feet elliptical stained area below the piping between the diesel tanks.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. The potential human health risks at the site are not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are low. Therefore, under current site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of DRPH and GRPH detected in soil/gravel at the site, however, exceed ADEC guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected volume at the site is approximately 58 cubic yards of gravel between the diesel tanks. The remedial action alternative recommended for the site is passive bioremediation. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.




POINT LONELY RADAR INSTALLATION

USAF 611th CES

FIGURE NO. 4-3

BEACH DIESEL TANKS (SS03) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 4-5. BEACH DIESEL TANKS ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Beach Diesel Tanks (SS03)
Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | S02-2.5 | S03 | S04-0.75 & S05-0.75 (Replicates) | | AB01 | EB01 | TB01 | | |
| Laboratory Sample ID Numbers | | | | | 536 4357-4 | 538 | 540 | 542 | 544 | 906 | 530/534 4357-1 | 528 4357-8 | #5-82793 #3&4-82593 4357 | #5-82593 #1&2-82593 4357 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-12 | 50-120 | 500[a] | <190[b]-150J[b] | <50[b] | <60[b] | <120[b] | <100[b] | <60[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-0.5 | 2-5 | 100 | <20J[b]-27J[b] | <2J[b] | <2J[b] | <4J[b] | <5J[b] | <2J[b] | <100J[b] | <100J[b] | <100J[b] | <50 | <1 |
| RRPH (Approx.) | 10-20 | 100-200 | 2,000[a] | <180-<670 | <100 | <120 | <200 | <200 | <120 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | <0.10 | <0.10 | <0.20 | <0.25 | <0.10 | | | | | |
| Benzene | 0.002-0.005 | 0.02-0.05 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.04 | <0.05 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002-0.005 | 0.02-0.05 | | <0.2-0.5 | <0.02 | <0.02 | <0.04 | <0.05 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002-0.005 | 0.02-0.05 | | <0.2-0.2 | <0.02 | <0.02 | <0.04 | <0.05 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.010 | 0.04-0.10 | | <0.4-2.0J | <0.04 | <0.04 | <0.08 | <0.10 | <0.04 | <2 | <2 | <2 | <2 | <0.04 |
| VOC 8260 | | | | | | | | | | | | | | |
| Naphthalene | 0.020 | <0.020 | | <0.300-0.211 | 0.039 | NA | NA | NA | NA | NA | <1 | <1 | <1 | <0.020 |
| Toluene | 0.020 | <0.020 | | <0.300-<0.500 | 0.033 | NA | NA | NA | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,2,4-Trimethylbenzene | 0.020 | <0.020 | | <0.300-0.956 | 0.174 | NA | NA | NA | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,3,5-Trimethylbenzene | 0.020 | <0.020 | | <0.300-0.409 | 0.071 | NA | NA | NA | NA | NA | <1 | <1 | <1 | <0.020 |
| Xylenes (Total) | 0.040 | <0.040 | | <0.600-2.267 | 0.116 | NA | NA | NA | NA | NA | <2 | <2 | <2 | <0.040 |
| SVOC 8270 | 0.200 | 0.210-0.552 | | <5.00-<30.0 | <0.210-0.552U | NA | NA | NA | NA | NA | <29 | NA | <10 | 0.459 |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-5. BEACH DIESEL TANKS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Beach Diesel Tanks (SS03)
Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples: 2S06 & 2S07 (Replicates) | | Environmental Samples: SD01 | Environmental Samples: SD02 | Field Blanks: AB01 | Field Blanks: EB01 | Field Blanks: EB05 | Field Blanks: TB01 | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | 1806 | 1808 | 548 | 548 | 906 | 530<br>534 | 1796<br>1798<br>4626-6 | 528 | #5-82793<br>#3&4-82593<br>4626 | #5-82593<br>#1&2-9793<br>#1&2-82593 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 6-10 | 60-100 | 500[a] | <190[b]-150J[b] | 15,200J[b] | 13,700J[b] | <60[b] | <60[b] | NA | <1,000[b] | <200[c] | NA | <200-<1,000 | <50 |
| GRPH | 0.2-0.3 | 2-3 | 100 | <20J[b]-27J[b] | 150[b] | 13J[b] | <2J[b] | <2J[b] | <100J[b] | <100J[b] | <20[c] | <100J[b] | <20-<50 | <1 |
| RRPH (Approx.) | 12-20 | 120-200 | 2,000[a] | <180-<670 | <200 | <200 | <200 | <120 | NA | <2,000 | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1-2.7J | 1.8 | 0.8J | <0.10 | <0.10 | | | | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | 0.3 | 0.2 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <1 | <0.02-<0.03 |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | 1.5 | 0.6J | <0.04 | <0.04 | <2 | <2 | <2 | <2 | <2 | <0.04-<0.09 |
| HVOC 8010 | 0.01 | 0.1 | | <0.04-<0.3 | <0.1 | <0.1 | NA | NA | <1 | <1 | <1 | <1 | <1 | <0.02-<0.2 |

CT&E Data.
F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L, respectively.

# TABLE 4-5. BEACH DIESEL TANKS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Beach Diesel Tanks (SS03)
Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | | | | AB01 | EB01 | TB01 | |
| Laboratory Sample ID Numbers | | | | | 549 552 4357-7 | 550 554 | | | | 906 | 530 534 4357-1 | 528 4357-8 | #5-82793 #3&4-82593 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000[b] | <1,000[b] | | | | NA | <1,000[b] | NA | <1,000 |
| GRPH | 5-10 | 50-100 | | <100J[b] | <50[b] | <100J[b] | | | | <100J[b] | <100J[b] | <100J[b] | <50 |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | | | | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | | | | <1 | <1 | <1 | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | | | | <1 | <1 | <1 | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | | | | <1 | <1 | <1 | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | <2 | | | | <2 | <2 | <2 | <2 |
| VOC 8260 | 1 | 1-2.9 | | <1-7.9 | <1-2.9U | NA | | | | NA | <1-1.3 | <1 | <1 |
| SVOC 8270 | 10 | 13 | | <10 | <13-<13J | NA | | | | NA | <29 | NA | <10 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 43,600 | NA | | | | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | 18,000 | NA | | | | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 1,430,000 | NA | | | | NA | NA | NA | <10,000 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
U Compound is not present above the concentration listed.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 4-6. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE BEACH DIESEL TANKS (SS03)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Beach Diesel Tanks (SS03) | Soil or Sediment | DRPH | 15,200J | mg/kg | <190-150J | -- | -- | 500[c] | **Yes** |
| | | GRPH | 150 | mg/kg | <20J-27J | -- | -- | 100[c] | **Yes** |
| | | Toluene | 0.033 | mg/kg | <0.2-<0.5 | -- | 5,400 | -- | No |
| | | Ethylbenzene | 0.3 | mg/kg | <0.2-0.5 | -- | 2,700 | -- | No |
| | | Xylenes (total) | 1.5 | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | | Naphthalene | 0.039 | mg/kg | <0.300-0.211 | -- | 100 | -- | No |
| | | 1,2,4-Trimethylbenzene | 0.174 | mg/kg | <0.300-0.956 | -- | -- | -- | No |
| | | 1,3,5-Trimethylbenzene | 0.071 | mg/kg | <0.300-0.409 | -- | -- | -- | No |
| | Surface Water | All surface water samples were Non Detect | | | | | | | |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
J Result is an estimate.
-- Not applicable.

## 4.4 POL STORAGE (SS04)

### 4.4.1 Site Background

The POL Storage site is a gravel pad area located northeast of the Diesel Spills site and adjacent to the road to the beach. This site is a gravel pad placed on relatively flat tundra that was previously used to store POLs. A diesel fuel pipe from the Beach Diesel Tanks runs along the gravel pad tundra border on the west edge of the site. During the 1993 RI, there were one approximately 3,000 gallon jet fuel tank and several 55-gallon drums of other products stored at the site. A small stained area of limited extent was noted on the gravel pad during the 1993 RI.

Previous sampling, conducted in 1986, 1987, and 1990 by Air Force contractors, detected petroleum compounds (TPH) in soil and surface water and one solvent in surface water at the site. A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993a).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 4.4.3.

### 4.4.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the POL Storage (SS04) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**4.4.2.1 Summary of Samples Collected**. A total of six samples was collected at the site. These consisted of two soil samples, three sediment samples, and one surface water sample. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the POL Storage (SS04) site are presented in Figure 4-4.

The two soil samples were analyzed for DRPH, GRPH, RRPH, BTEX, and HVOCs. In addition, one soil sample was analyzed for VOCs, total metals, and TOC.

Three sediment samples were analyzed for DRPH and RRPH. In addition, two samples were analyzed for GRPH, BTEX, and HVOCs.

One surface water sample was analyzed for GRPH, BTEX, VOCs, SVOCs, total and dissolved metals, TOC, TSS, and TDS.

**4.4.2.2 Analytical Results**. The data summary table (Table 4-7) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds and inorganic analytes with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 4-4. All organic

compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. Only metals detected above background levels that exceed an RBSL or ARAR are presented on Figure 4-4. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds and inorganic analytes detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil/sediment samples collected at the site include GRPH, BTEX compounds, and two other VOCs. GRPH were detected in sediment sample SS01-SD01 at 64 mg/kg. BTEX (total) were detected in the same samples at 7.5 mg/kg. Xylenes were the primary component; however, benzene was detected at 1.6 mg/kg. Two HVOCs (trichloroethene and tetrachloroethene) were detected in two soil/sediment samples at concentrations ranging from 0.36 to 24 mg/kg. Trichloroethene was the primary component.

In the surface water sample (sample SS04-SW01), organic compounds detected include GRPH, BTEX, four other VOCs, and three SVOCs. GRPH were detected at 3,000 µg/L. Benzene, toluene, ethylbenzene, and xylenes were detected at 562, 1,220, 13, and 518 mg/kg, respectively. Four other VOCs, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, and trichloroethene, were detected at 1,020, 161, 1,830, and 285 mg/kg, respectively. Three SVOCs, phenol, 4-methylphenol, and naphthalene, were detected at 27.6, 110, and 18.8 mg/kg, respectively.

**Inorganics**. No metals were detected at concentrations above background levels in the soil sample at the site.

In the surface water sample SS04-SW01, metals analyses detected four metals (barium, calcium, manganese, and potassium) at levels above background concentrations. Barium was detected at 340 µg/L. Calcium was detected at 9,500 µg/L. Manganese was detected at 3,100 mg/kg, and potassium was detected at 8,300 µg/L.

TOC was reported at 8,510 mg/kg in soil sample SS04-S01. TOC, TSS, and TDS were reported at 52,900, 130,000, and 681,000 µg/L, respectively, in surface water sample SS04-SW01.

**4.4.2.3 Summary of Site Contamination**. Previous sampling conducted at the POL Storage (SS04) detected petroleum hydrocarbons (TPH) in the soil and petroleum hydrocarbons (TPH and oil/grease) and one VOC in the surface water at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

During previous sampling conducted in 1992, TPH were detected in six soil samples ranging from 2 to 5,400 mg/kg. In previous surface water samples collected, TPH were detected at 1,500 and 2,000 µg/L, and oil and grease were detected at 7,000 µg/L. Trichlorofluoromethane was detected in previous surface water samples at 0.81 and 0.76 µg/L.

A comparison of historical and current project data indicates that there is a lower concentration of petroleum hydrocarbons in soil than there has been in the past; however, there is a higher level of petroleum hydrocarbons in surface water. Maximum concentrations of compounds detected in soil during the 1993 RI include GRPH at 64 mg/kg, BTEX (total) at 7.5 mg/kg, and VOCs at 24 mg/kg. Compounds detected in surface water during the 1993 RI include GRPH (0.36 $\mu$g/L), BTEX compounds (ranging from 13 to 1,220 $\mu$g/L), four other VOCs (161 to 1,830 $\mu$g/L), and three SVOCs (18.8 to 110 $\mu$g/L). Differences between past and current data are likely to be a result of more extensive sampling during the 1993 RI. The human health and ecological risks associated with chemicals detected at the site are presented in Section 4.4.4 and 4.4.5. The suspected source of contaminants detected during sampling conducted at the POL Storage is spills and/or leaks from the drums that were located on the tundra during the 1993 RI or from previous drum storage activities at the site.

### 4.4.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**4.4.3.1 Topography and Stratigraphy**. The site consists of an approximately three feet thick gravel pad placed on the tundra. The topography in this area is generally flat. The gravel pad and adjacent road provide the greatest relief at the site. The gravel pad is adjacent to tundra north and west of the site and to a continuing gravel pad south and east of the site. A gravel road extends from the north end of the site out to the Beaufort Sea.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

**4.4.3.2 Migration Potential**.

**Subsurface Migration**. The site topography indicates that active layer water flow should be very sluggish. It should generally follow the surface contours and flow to the west and northwest out from the gravel pad to the tundra. At the west edge of the gravel pad at the site are tundra ponds that should receive active layer water from the gravel pad. Affected active layer water that enters these water bodies no longer presents a potential for subsurface migration, but a potential for surface migration is then created. The lack of contaminants in the subsurface soil in the gravel pad indicates that the potential of subsurface migration is low.

**Surface Migration**. The primary route of surface migration over the gravel pad portion of the site is overland sheet flow. Significant surface migration over the gravel pad area is probably restricted to the spring thaw when large quantities of meltwater are available and the frozen ground prevents active layer flow. Surface migration on the gravel pad will follow surface contours, which are generally west and northwest from the gravel pad out to the tundra and surface water bodies that border the site.

Bordering the site to the west are tundra areas where surface water migrates through a series of tundra ponds connected by sluggish ephemeral streams. Adjacent to the gravel pad are two tundra ponds which receive most of the runoff from the gravel pad. In addition, the southern most of these two ponds drains north through a small stream into the northern most pond. A surface water sample collected from this pond indicates that is an active migration pathway. A surface water sample collected from a pond in the north section of the tundra confirms that this is likely to be an active contaminant migration pathway.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Analytical results indicate that contaminant migration is occurring to a limited degree in the surface water at the site. The topography indicates that any surface migration will be sluggish but will generally migrate west off the gravel and then north in the tundra. The exact source of the contaminants detected in the tundra pond at the site is unknown; however, it is suspected that the source of the contaminants in the surface water is spills and/or leaks from the 55-gallon drums that appeared to have blown off the gravel pad and down to the tundra or from previous drum storage activities at the site.

#### 4.4.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the POL Storage (SS04) site include Air Force contractor personnel periodically working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at the site are presented in Section 4.4.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative

species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 4.4.5.

### 4.4.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the POL Storage (SS04) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**4.4.4.1 Chemicals of Concern**. Benzene, tetrachloroethene, and trichloroethene were identified as COCs for the soil matrix at the POL Storage. Benzene exceeded its background concentration and the ARAR, which is a state of Alaska soil cleanup level for Non-UST contaminated soils. Tetrachloroethene and trichloroethene exceeded background levels and the associated RBSLs based on cancer risk.

Several chemicals were identified as COCs for the surface water at the POL Storage site, including:

- GRPH - exceeds cancer and noncancer RBSLs;
- Benzene - exceeds cancer RBSL and MCL (ARAR);
- cis-1,2-Dichloroethene - exceeds noncancer RBSL and MCL (ARAR);
- Methylene chloride - exceeds cancer RBSL and MCL (ARAR);
- Tetrachloroethene - exceeds cancer and noncancer RBSLs and MCL (ARAR);
- Trichloroethene - exceeds MCL (ARAR);
- Toluene - exceeds noncancer RBSL and MCL (ARAR);
- 4-Methylphenol - exceeds noncancer RBSL;
- Barium - exceeds noncancer RBSL and MCL (ARAR); and
- Manganese - exceeds noncancer RBSL.

Table 4-8, Identification of COCs at the POL Storage, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, ARARs, and the COCs selected in the risk evaluation.

**4.4.4.2 Exposure Pathways and Potential Receptors.** Because COCs were identified for soil/sediment and surface water at the site, the potential risks associated with ingestion of soil/sediment and surface water were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

**4.4.4.3 Risk Characterization.**

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** The noncancer hazard associated with the ingestion of soil at the POL Storage by a hypothetical native northern adult/child is 0.001, and by a DEW Line worker is <0.001, based on the maximum concentrations of the COC. The presence of tetrachloroethene accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of soil or sediment at the site by a hypothetical native northern adult/child is $9 \times 10^{-8}$, and by a DEW Line worker is $4 \times 10^{-9}$, based on the maximum concentration of the carcinogenic COCs. The presence of benzene, tetrachloroethene, and trichloroethene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** The noncancer hazard associated with the ingestion of surface water at the POL Storage (SS04) site by a hypothetical native northern adult is 14, and by a DEW Line worker is 1.0, based on the maximum concentrations of the COCs. Several chemicals contribute to the noncancer hazard; however, manganese, tetrachloroethene, and cis-1,2-dichloroethene contribute more than 99 percent of the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of surface water at this site by a hypothetical native northern adult is $2 \times 10^{-3}$, and by a DEW Line worker is $2 \times 10^{-6}$, based on the maximum concentrations of the COCs. Several chemicals (GRPH, benzene, methylene chloride, tetrachloroethene, and trichloroethene) contribute to the excess lifetime cancer risk; however, tetrachloroethene contributes about 75 percent of the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the soil/sediment at the POL Storage are the very low noncancer hazard (hazard indices of 0.001 and <0.001) and the very low cancer risk associated with benzene and tetrachloroethene. These risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one (EPA 1991c), and on the basis of the human health risk assessment remediation of the site is not warranted.

The potential risks and hazards associated with the surface water at the POL Storage (SS04) are the noncancer hazard (hazard indices of 1.0 and 14), and cancer risks of $2 \times 10^{-3}$ and $2 \times 10^{-6}$ associated with the carcinogenic COCs at the site. The potential risks and hazards were calculated assuming the affected surface water would be used as a sole-source water supply for 180 days per year. The surface water expressions at the site are frozen most of the year; many are only intermittently filled with water during the summer months. The surface water at the site is not known to be used as a water supply now, nor has it been used in the past. In addition, the hazards and risks at the site are based on the maximum concentrations detected at the site. Therefore, the hazards and risks at the site are likely to be overestimated because they are based on a potential future residential scenario. However, the COCs identified in surface water at the POL Storage site could potentially pose a threat to human health under the conditions assumed in the Risk Assessment (U.S. Air Force 1996). Remedial action is generally warranted at sites where the excess lifetime cancer risk is $>1 \times 10^{-4}$, or the noncancer hazard significantly exceeds one (EPA 1991c). On the basis of the human health risk assessment, remediation of the site may be warranted.

### 4.4.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**4.4.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. GRPH, tetrachlorethene, and manganese were identified as COCs in surface water, and the COCs in soil/sediment at the POL Storage site were benzene and xylenes. None of the identified COCs were associated with significant ecological risk estimates at the POL Storage site.

**4.4.5.2 Summary of Ecological Risk Assessment**. Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the POL Storage site are not significant.

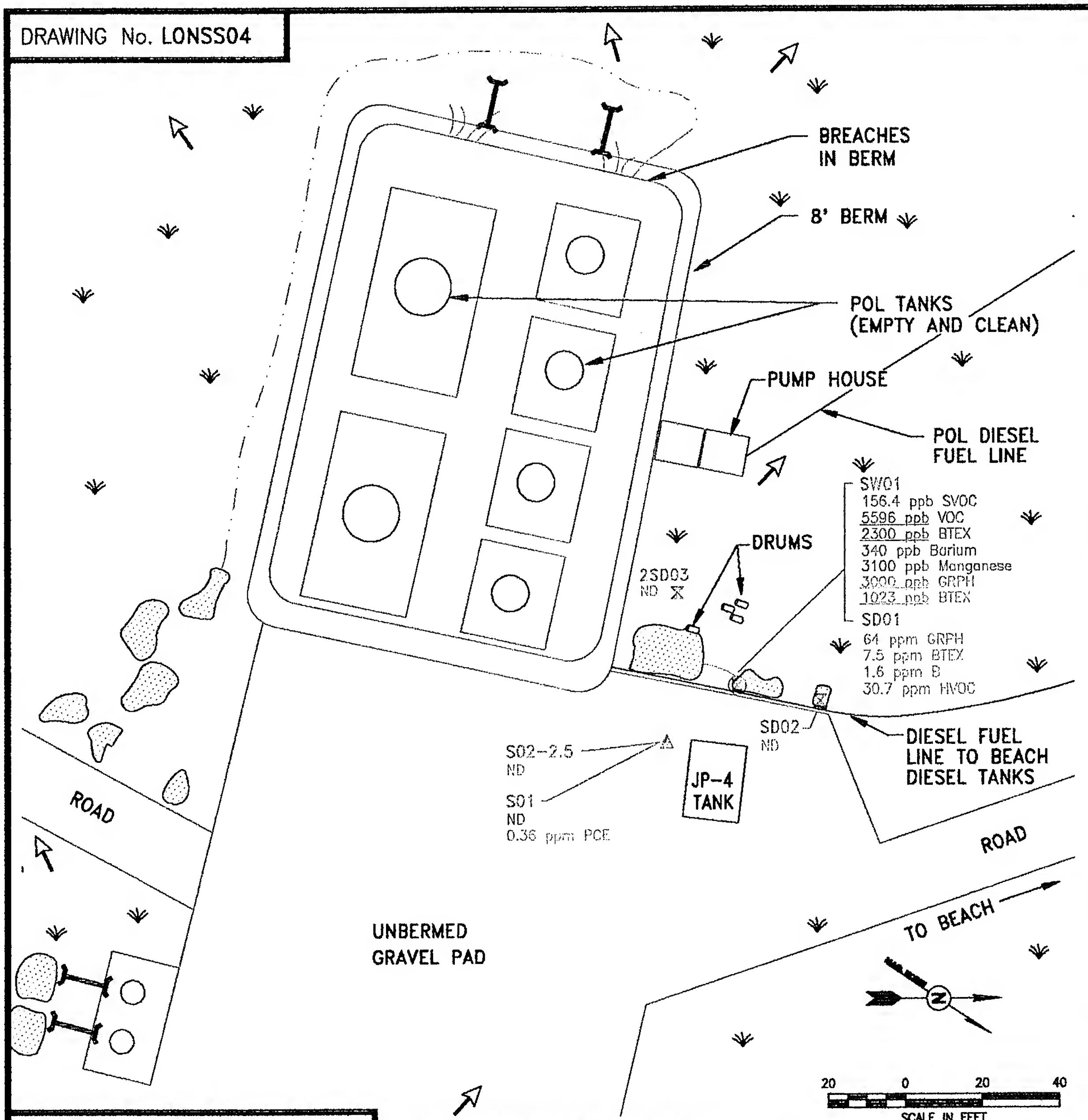
### 4.4.6 Conclusions and Recommendations

Sampling and analyses have determined that a small limited area at the POL Storage (SS04) site is contaminated with petroleum hydrocarbons (GRPH, BTEX, and other VOCs that are primarily associated with gasoline and diesel fuels) and solvents. The affected area at the site is the surface water and associated sediments adjacent to the west edge of the gravel pad at the site. The affected area appears to be localized, and migration of contaminants from the site appears to be minimal.

The risk assessment concluded that risks posed to ecological receptors by site contaminants are minimal given current site uses. However, risks and hazards could pose a threat to human health under the future scenario conditions assumed in the risk assessment (U.S. Air Force 1996). The potential human health risks at the site are of a magnitude that normally requires remedial action (i.e, cancer risk >1 x $10^{-4}$ and noncancer hazard >1). Therefore, under current site conditions and considering the findings of the risk assessment, remediation of the site is recommended.

In addition, levels of GRPH, benzene, cis-1,2-dichloroethene, methylene chloride, tetrachlorethene, trichloroethene, and toluene detected in tundra surface water at the site exceed ADEC and federal guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected area at the site is limited to the surface water in the tundra pond adjacent to the west end of the gravel pad. The remedial action alternative recommended for the site is removal of the 55-gallon drums located on the tundra and gravel pad that are suspected to be the source of the contaminants. If necessary, the drums will be overpacked. The contents of the drums will then be sampled to determine what further action is necessary for drum disposal. In addition, surface water samples will be collected to determine the current water quality at the site and to access if additional remedial actions are warranted. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.

DRAWING No. LONSS04




LEGEND

- BUILDINGS, STRUCTURES
- ROADS, IMPROVED
- SOIL SAMPLE
- SEDIMENT SAMPLE
- SEDIMENT AND WATER SAMPLES
- TUNDRA
- SURFACE WATER
- CULVERT
- GRAVEL PAD BOUNDARY
- SURFACE DRAINAGE
- 2.6 ppm CT&E DATA
- 0.9 ppm F&B DATA

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| SVOC | TOTAL SEMI-VOLATILE ORGANIC COMPOUNDS |
| VOC | TOTAL VOLATILE ORGANIC COMPOUNDS |
| DRPH | DIESEL RANGE PETROLEUM HYDROCARBONS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |
| B | BENZENE |
| HVOC | TOTAL HALOGENATED VOLATILE ORGANIC COMPOUNDS |
| PCE | TETRACHLOROETHENE |

***POINT LONELY RADAR INSTALLATION***

**USAF 611th CES**

FIGURE NO. 4-4

POL STORAGE (SS04) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: POL Storage (SS04)

Matrix: Soil/Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | S02-2.5 | SD01 | SD02 | 2SD03 | AB01 | EB01 | EB05 | TB01 | | |
| Laboratory Sample ID Numbers | | | | | 518 4355-6 | 524 | 520 | 522 | 1795 | 906 | 530 534 | 1796 1798 4626-6 | 528 4357-8 | #5-82793 #3&4-82593 4626 | #5-82593 #1&2-82593 4355 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-12 | 50-120 | 500[a] | <190[b]-150J[b] | <2,000[b] | <50[b] | <60[b] | <60[b] | <120[b] | NA | <1,000[b] | <200[c] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20[b]-27[b] | <2J[b] | <2J[b] | 64J[b] | <2J[b] | NA | <100J[b] | <50J[b] | <20[c] | <100J[b] | <50 | <1 |
| RRPH (Approx.) | 10-24 | 100-240 | 2,000[a] | <180-<670 | <100 | <120 | <120 | <120 | <240 | NA | <2,000 | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | <0.10 | 7.5J | <0.10 | NA | | | | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | 1.6 | <0.02 | NA | <1 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | <0.02 | <0.02 | 1.4 | <0.02 | NA | <1 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | <0.02 | <0.02 | 2.0 | <0.02 | NA | <1 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | <0.04 | <0.04 | 2.5J | <0.04 | NA | <2 | <2 | <2 | <2 | <2 | <0.04 |
| HVOC 8010 | | | | | | | | | | | | | | | |
| Trichloroethene | 0.002 | 0.02 | | <0.04-<0.3 | <0.02 | <0.02 | 24 | <0.02 | NA | <1 | <1 | <1 | <1 | <1 | <0.02 |
| Tetrachloroethene | 0.002 | 0.02 | | <0.04-<0.3 | 0.36 | <0.02 | 6.7J | <0.02 | NA | <1 | <1 | <1 | <1 | <1 | <0.02 |
| VOC 8260 | 0.020 | 0.100 | | <0.300-2.267 | <0.100 | NA | NA | NA | NA | NA | <1 | <1 | <1 | <1 | <0.020 |
| TOC | | | | 99,600-473,000 | 8,510 | NA | NA | NA | NA | NA | <5,000 | NA | NA | NA | NA |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH concentrations were detected at <1,000[b] and <50[b] µg/L, respectively.

# TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY (CONTINUED)

| Installation: Point Lonely<br>Site: POL Storage (SS04) | Matrix: Soil<br>Units: mg/kg | | METALS ANALYSES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
| | | | | | S01 | | | | | EB01 | |
| Laboratory Sample ID Numbers | | | | | 4355-6 | | | | | 4357-1 | 4355<br>4357 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | | | µg/L | µg/L |
| Aluminum | 0.35 | 2 | | 1,500-25,000 | 2,400 | | | | | <100 | <100 |
| Antimony | N/A | 51 | | <7.8-<230 | <51 | | | | | <100 | <100 |
| Arsenic | 0.11 | 51 | | <4.9-8.5 | <51 | | | | | <100 | <100 |
| Barium | 0.024 | 1 | | 27-390 | 72 | | | | | <50 | <50 |
| Beryllium | N/A | 2.6 | | <2.6-6.4 | <2.6 | | | | | <50 | <50 |
| Cadmium | 0.33 | 2.6 | | <3.0-<36 | <2.6 | | | | | <50 | <50 |
| Calcium | 0.69 | 4 | | 360-59,000 | 45,000 | | | | | 270 | <200 |
| Chromium | 0.066 | 1 | | <4.3-47 | 3.4 | | | | | <50 | <50 |
| Cobalt | N/A | 5.1 | | <5.1-12 | <5.1 | | | | | <100 | <100 |
| Copper | 0.045 | 1 | | <2.7-45 | 3.2 | | | | | <50 | <50 |
| Iron | 0.50 | 2 | | 5,400-35,000 | 11,000 | | | | | <100 | <100 |
| Lead | 0.13 | 5.1 | | <5.1-22 | <5.1 | | | | | <100 | <100 |
| Magnesium | 0.96 | 4 | | 360-7,400 | 25,000 | | | | | <200 | <200 |
| Manganese | 0.025 | 1 | | 25-290 | 130 | | | | | <50 | <50 |
| Molybdenum | N/A | 2.6 | | <2.5-<11 | <2.6 | | | | | <50 | <50 |
| Nickel | 0.11 | 1 | | 4.2-46 | 5.1 | | | | | <50 | <50 |
| Potassium | 23 | 100 | | <300-2,200 | 420 | | | | | <5,000 | <5,000 |
| Selenium | 1.2 | 51 | | <7.8-<170 | <51 | | | | | <100 | <100 |

☐ CT&E Data.
N/A Not available

## TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: POL Storage (SS04)

Matrix: Soil
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | | | | | EB01 | |
| Laboratory Sample ID Numbers | | | | | 4355-6 | | | | | 4357-1 | 4355<br>4357 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | | | µg/L | µg/L |
| Silver | 0.53 | 26 | | <3-<110 | <26 | | | | | <50J | <50 |
| Sodium | 0.55 | 5 | | <160-680 | 140 | | | | | 370J | <250 |
| Thallium | 0.011 | 0.26 | | <0.2-<1.2 | <0.26 | | | | | <5 | <5 |
| Vanadium | 0.036 | 1 | | 6.3-59 | 10 | | | | | <50 | <50 |
| Zinc | 0.16 | 1 | | 9.2-95 | 12 | | | | | <50 | <50 |

☐ CT&E Data.
N/A Not available

# TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: POL Storage (SS04)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Sample | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | AB01 | EB01 | TB01 | |
| Laboratory Sample ID Numbers | | | | | 512<br>514<br>4355-3 | | | | 906 | 530<br>534<br>4357-1 | 528<br>4357-8 | #3&4-82593<br>4355 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L | µg/L | µg/L |
| GRPH | 5 | 50 | | <1,000[b] | 3,000J[b] | | | | <100J[b] | <50J[b] | <100J[b] | <50 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | 230 | | | | <1 | <1 | <1 | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | 580 | | | | <1 | <1 | <1 | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | 13J | | | | <1 | <1 | <1 | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | 200J | | | | <2 | <2 | <2 | <2 |
| VOC 8260 | | | | | | | | | | | | |
| Benzene | 1 | 50 | 5 | <1 | 562 | | | | NA | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | 1 | 50 | 70 | <1 | 1,020 | | | | NA | <1 | <1 | <1 |
| Methylene Chloride | 1 | 50 | 5 | <1 | 161 | | | | NA | <1 | <1 | <1 |
| Tetrachloroethene | 1 | 50 | 5 | <1 | 1,830 | | | | NA | <1 | <1 | <1 |
| Toluene | 1 | 50 | 1,000 | <1 | 1,220 | | | | NA | <1 | <1 | <1 |
| Trichloroethene | 1 | 50 | 5 | <1 | 285 | | | | NA | <1 | <1 | <1 |
| Xylenes (Total) | 1 | 100 | 10,000 | <2 | 518 | | | | NA | <2 | <2 | <2 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
b GRPH concentrations reported for these samples are equivalent to gasoline range organics (GRO) as defined by ADEC.

## TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: POL Storage (SS04)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Sample | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | AB01 | EB01 | TB01 | |
| Laboratory Sample ID Numbers | | | | | 512<br>514<br>4355-3 | | | | 906 | 530<br>534<br>4357-1 | 528<br>4357-8 | #3&4-82593<br>4355 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L | µg/L | µg/L |
| SVOC 8270 | | | | | | | | | | | | |
| Phenol | 10 | 29 | | <10.2-<11 | 27.6J | | | | NA | <29 | NA | <10 |
| 4-Methylphenol | 1 | 29 | | <10.2-<11 | 110 | | | | NA | <29 | NA | <10 |
| Naphthalene | 1 | 29 | | <10.2-<11 | 18.8J | | | | NA | <29 | NA | <10 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | 52,900 | | | | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 200 | | 5,000-12,000 | 130,000 | | | | NA | NA | NA | <200 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | 681,000 | | | | NA | NA | NA | <10,000 |

☐ CT&E Data.
NA Not analyzed.
J Result is an estimate.

## TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: POL Storage (SS04)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL
(DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | | EB01 | |
| Laboratory Sample ID Numbers | | | | | 4355-3 | | | | | 4357-1 | 4355<br>4357 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Aluminum | 17.4 | 100 | | <100-350<br>(<100-340) | 130<br>(<100)J | | | | | <100 | <100 |
| Antimony | N/A | 100 | 6 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Arsenic | 5.3 | 100 | 50 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Barium | 1.2 | 50 | 2,000 | <50-93<br>(<50-91) | 340<br>(250) | | | | | <50 | <50 |
| Beryllium | N/A | 50 | 4 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Cadmium | 1.7 | 50 | 5 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Calcium | 34.5 | 200 | | 4,500-88,000<br>(4,100-86,000) | 95,000J<br>(97,000) | | | | | 270 | <200 |
| Chromium | 3.29 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Cobalt | N/A | 100 | | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |
| Copper | 2.3 | 50 | 1,300 | <50<br>(<50) | <50<br>(<50) | | | | | <50 | <50 |
| Iron | 25 | 100 | | 180-2,800<br>(<100-1,600) | 2,600<br>(8,500) | | | | | <100 | <100 |
| Lead | 6.6 | 100 | 15 | <100<br>(<100) | <100<br>(<100) | | | | | <100 | <100 |

☐ CT&E Data.
N/A Not available
J Result is an estimate.

## TABLE 4-7. POL STORAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: POL Storage (SS04)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL (DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Sample | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | | | | | EB01 | |
| Laboratory Sample ID Numbers | | | | | 4355-3 | | | | | 4357-1 | 4355 4357 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | | | | | µg/L | µg/L |
| Magnesium | 47.8 | 200 | | <5,000-53,000 (2,600-54,000) | 35,000 (36,000) | | | | | <200 | <200 |
| Manganese | 1.24 | 50 | | <50-510 (<50-120) | 3,100 (3,000) | | | | | <50 | <50 |
| Molybdenum | N/A | 50 | | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Nickel | 5.5 | 50 | 100 | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Potassium | 1,154 | 5,000 | | <5,000 (<5,000) | 8,300 (8,100) | | | | | <5,000 | <5,000 |
| Selenium | 62.4 | 100 | 50 | <100 (<100) | <100 (<100) | | | | | <100 | <100 |
| Silver | 2.6 | 50 | 50 | <50 (<50) | <50J (<50)J | | | | | <50J | <50 |
| Sodium | 27.7 | 250 | | 8,400-410,000 (8,200-450,000) | 83,000 (80,000) | | | | | 370J | <250 (<250) |
| Thallium | 0.57 | 5 | 2 | <5 (<5) | <5J (<5) | | | | | <5 | <5 |
| Vanadium | 1.8 | 50 | | <50 (<50) | <50 (<50) | | | | | <50 | <50 |
| Zinc | 8.2 | 50 | | <50-160 (<50) | <50 (220) | | | | | <50 | <50-1,894 (196) |

☐ CT&E Data.
N/A Not available
J Result is an estimate.

## TABLE 4-8. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE POL STORAGE (SS04)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| POL Storage (SS04) | Soil or Sediment | GRPH | 64J | mg/kg | <20J-27J | -- | -- | 100[c] | No |
| | | Benzene | 1.6 | mg/kg | <0.04-<0.5 | 2.2 | -- | 0.5[c] | **Yes** |
| | | Toluene | 1.4 | mg/kg | <0.2-0.5 | -- | 5,400 | -- | No |
| | | Ethylbenzene | 2.0 | mg/kg | <0.2-0.2 | -- | 2,700 | -- | No |
| | | Xylenes (total) | 2.5J | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | | Trichloroethene | 24 | mg/kg | <0.04-<0.5 | -- | -- | -- | No |
| | | Tetrachloroethene | 6.7J | mg/kg | <0.04-<0.5 | 1.23 | 270 | -- | **Yes** |
| | | Aluminum | 2,400 | mg/kg | 1,500-25,000 | -- | -- | -- | No |
| | | Barium | 72 | mg/kg | 27-390 | -- | 1,890 | -- | No |
| | | Calcium | 45,000 | mg/kg | 360-59,000 | -- | -- | -- | No |
| | | Chromium | 3.4 | mg/kg | <4.3-47 | -- | 135 | -- | No |
| | | Copper | 3.2 | mg/kg | <2.7-45 | -- | 999 | -- | No |
| | | Iron | 11,000 | mg/kg | 5,400-35,000 | -- | -- | -- | No |
| | | Magnesium | 25,000 | mg/kg | 360-7,400 | -- | -- | -- | No |
| | | Manganese | 130 | mg/kg | 25-290 | -- | 3,780 | -- | No |
| | | Nickel | 5.1 | mg/kg | 4.2-46 | -- | 540 | -- | No |
| | | Potassium | 420 | mg/kg | <300-2,200 | -- | -- | -- | No |
| | | Sodium | 140 | mg/kg | <160-680 | -- | -- | -- | No |
| | | Vanadium | 10 | mg/kg | 6.3-59 | -- | 189 | -- | No |
| | | Zinc | 12 | mg/kg | 9.2-95 | -- | 8,100 | -- | No |
| | Surface Water | GRPH | 3,000J | µg/L | <1,000 | 50 | 730 | -- | **Yes** |
| | | Benzene | 562 | µg/L | <1 | 0.617 | -- | 5[d] | **Yes** |
| | | cis-1,2-Dichloroethene | 1020 | µg/L | <1 | -- | 36.5 | 70[e] | **Yes** |

## TABLE 4-8. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE POL STORAGE (SS04) (CONTINUED)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] CANCER | RBSL[a] NON-CANCER | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| POL Storage (SS04) | Surface Water | Methylene Chloride | 161 | µg/L | <1 | 6.30 | 173 | 5[f] | Yes |
| (Continued) | (Continued) | Tetrachloroethene | 1,830 | µg/L | <1 | 1.43 | 36.5 | 5[e] | Yes |
| | | Trichloroethene | 285 | µg/L | <1 | -- | -- | 5[d] | Yes |
| | | Ethylbenzene | 13J | µg/L | <1 | -- | 158 | 700[e] | No |
| | | Toluene | 1,220 | µg/L | <1 | -- | 96.5 | 1,000[e] | Yes |
| | | Xylenes (total) | 518 | µg/L | <2 | -- | 7,300 | 10,000[e] | No |
| | | Phenol | 27.6J | µg/L | <10.2-<11 | -- | 2,190 | -- | No |
| | | 4-Methylphenol | 110 | µg/L | <10.2-<11 | -- | 18.3 | -- | Yes |
| | | Naphthalene | 18.8J | µg/L | <0.3-<11 | -- | -- | -- | No |
| | | Aluminum | 130 | µg/L | <100-350 | -- | -- | -- | No |
| | | Barium | 340 | µg/L | <50-93 | -- | 256 | 2,000[g] | Yes |
| | | Calcium | 95,000J | µg/L | 4,500-88,000 | -- | -- | -- | No |
| | | Iron | 2,600 | µg/L | 180-2,800 | -- | -- | -- | No |
| | | Magnesium | 35,000 | µg/L | <5,000-53,000 | -- | -- | -- | No |
| | | Manganese | 3,100 | µg/L | <50-510 | -- | 18.3 | -- | Yes |
| | | Potassium | 8,300 | µg/L | <5,000 | -- | -- | -- | No |
| | | Sodium | 83,000 | µg/L | 8,400-410,000 | -- | -- | -- | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
e MCL, 56 FR 3526 (30 January 1991).
f MCL, 57 FR 31776 (17 July 1992).
g MCL, 56 FR 30266 (01 January 1991).
J Result is an estimate.
--- Not applicable.

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## 4.5 DIESEL SPILLS (SS05)

### 4.5.1 Site Background

The Diesel Spills (SS05) site consists of two inactive diesel tank farms located approximately 300 feet west of the main installation. The site consists of empty and cleaned diesel tanks, gravel pad, and adjacent tundra areas. The first tank farm consists of two of the installation's original diesel tanks. It was reported that a 25,000-gallon diesel spill occurred south of these two diesel tanks. The second bermed diesel tank farm is located approximately 200 feet west of the first tank farm. This large tank farm consists of six inactive diesel tanks, formerly the Husky Oil tanks. The berm at this tank was breached when the tanks were cleaned. Underlying the gravel pad and natural tundra surface are predominantly fine-grained soils typical of the coastal area, with permafrost generally below two feet in the tundra and three to four feet in the gravel pad.

Previous sampling, conducted in 1990 by Air Force contractors, detected petroleum hydrocarbons (TPH) in soil and surface water. A detailed list of concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 4.3.3.

### 4.5.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Diesel Spills (SS05) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**4.5.2.1 Summary of Samples Collected**. A total of 37 samples was collected at the site. These consisted of 17 soil, 13 sediment, and seven surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Diesel Spills (SS05) site are presented in Figure 4-5.

Seventeen soil samples were analyzed for DRPH, GRPH, and RRPH. In addition, 16 soil samples were analyzed for BTEX.

Thirteen sediment samples were analyzed for DRPH and RRPH. In addition, nine samples were analyzed for GRPH. Seven samples were analyzed for BTEX, and one sample was analyzed for VOCs, SVOCs, and TOC.

Seven surface water samples were analyzed for DRPH, GRPH, RRPH, and BTEX. In addition, one surface water sample was analyzed for VOCs, SVOCs, TOC, TSS, and TDS.

**4.5.2.2 Analytical Results**. The data summary table (Table 4-9) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each

of the analyses. Background levels are listed to allow direct comparison of naturally occurring organic compounds with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 4-5. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds detected above background levels at the site. A discussion of TDS, TSS, and TOC is included.

**Organics**. Organic compounds detected in soil and sediment samples collected at the site include DRPH, GRPH, RRPH, and BTEX compounds. DRPH were detected in 16 samples ranging from 50 to 4,300 mg/kg. GRPH were detected in eight samples at concentrations ranging from 7 to 120 mg/kg. RRPH were detected in one sediment sample, SS05-SD04, at 420 mg/kg. Total BTEX was detected in six samples at 2.28 to 10.2 mg/kg; xylenes were the primary component.

In surface water samples, organic compounds detected include GRPH, BTEX, and two other VOCs. GRPH were detected in one sample at a concentrations of 240 g/L. Benzene, ethylbenzene, and xylenes were detected in one surface water sample, SS05-SW03, at concentrations of 21, 10, and 46 μg/L, respectively. One other VOC, chloromethane, was detected in surface water sample SS05-SW07/SW08 at 2.3 μg/L.

One other VOC detected in the surface water was detected at similar concentrations in the background samples. This compound, 1,2-dichloroethane was detected at 4.4 μg/L in the environmental sample and ranged from 4.9 to 7.9 μg/L in the background samples. These detections are assumed to be the result of field decontamination procedures. The hexane and methanol used in the decontamination procedures may have contained impurities including 1,2-dichloroethane.

**Inorganics**. Metals were not a concern at this site, and no metals analyses were performed.

TOC was reported at 437,000 mg/kg in sediment sample SS05-SD07-1/SD08-1. TOC, TSS, and TDS were reported at 254,000, 8,260,000, and 326,000 μg/L, respectively, in surface water sample SS05-SW07/SW08.

**4.5.2.3 Summary of Site Contamination**. Previous sampling conducted at the Diesel Spills (SS05) detected petroleum hydrocarbons (TPH) in the soil and surface water at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

During sampling conducted in 1990, TPH were detected in soil samples ranging from 830 to 25,000 mg/kg. In the previous surface water samples collected, TPH were detected ranging from 100 to 300 μg/L.

A comparison of historical and current project data indicates that there is a lower concentration of petroleum hydrocarbons in soil and surface water than there has been in the past. Maximum concentrations of compounds detected in soil during the 1993 RI include DRPH at 4,300 mg/kg, GRPH at 120 mg/kg, RRPH at 420 mg/kg, and BTEX (total) at 10.2 mg/kg. Compounds detected in surface water during the 1993 RI include GRPH at 240 µg/L, benzene at 21 µg/L, ethylbenzene at 10 µg/L, xylenes at 46 µg/L, and two other VOCs detected at 2.3 and 4.4 µg/L. Lower concentrations selected during the 1993 RI sampling are likely due to the natural degradation of TPH. The human health and ecological risks associated with chemicals detected at the site are presented in Section 4.5.4 and 4.5.5. The suspected sources of contaminants detected during sampling conducted at the Diesel Spills are spills/leaks at the site.

Based on field data, source of contamination, and concentration of contaminants, the contaminated area at the site is limited to approximately 2,100 square feet of gravel and 400 square feet of tundra.

### 4.5.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**4.5.3.1 Topography and Stratigraphy**. The site consists of tundra areas, gravel pads and roads placed on the tundra (Figure 4-5), upon which bermed tank farms containing fuel storage tanks have been constructed. The topography in this area is generally flat. The gravel pads, bermed tank farms, and roads, which are approximately four feet thick, provide the greatest topographic relief at the site. The gravel areas slope to the tundra and drainage is generally radially out from the gravel pads and roads.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

#### 4.5.3.2 Migration Potential.

**Subsurface Migration**. Subsurface flow may be an active migration pathway at the site. The presence of petroleum compounds at depth in the gravel pad at the site indicates that these compounds may have impacted active layer water quality. Topographic information indicates that general active layer water flow at the site should be radially out from the gravel pad to the tundra; however, seasonal water flow within the site is suspected to be very sluggish due to the flat topography. Therefore, the potential for subsurface migration from the gravel pad at the site is moderate.

**Surface Migration**. The topography at the site dictates that drainage should be radial out from the gravel pad to the tundra. Drainage from the tundra also migrates radially out; however, surface migration is probably sluggish due to the flat topography. Significant surface migration

is probably restricted to spring thaw when large quantities of meltwater are available and the frozen ground prevents active layer water flow. The levels of petroleum compounds in surface soil/sediment indicate this may have been an active migration pathway; however, the lack of petroleum compounds in most surface water samples indicate the present potential of surface migration is minimal.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Site conditions and analytical results indicate there is a potential for contaminants to migrate in the active layer through the gravel pad. The amount of surface and subsurface flow, however, is restricted by the minor topographic relief and absence of significant upland source areas. Overall, the potential for onsite contaminant migration from the site is moderate, but the potential for offsite migration is minimal.

#### 4.5.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the Diesel Spills (SS05) site include Air Force contractor personnel periodically working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at the site are presented in Section 4.5.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the

representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 4.5.5.

### 4.5.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Diesel Spills (SS05) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**4.5.4.1 Chemicals of Concern**. DRPH, GRPH, and benzene were identified as COCs for the soil matrix at the Diesel Spills site. The maximum concentrations of DRPH and GRPH exceeded their background concentrations and the ARAR concentrations for petroleum hydrocarbon contamination of soil. Benzene exceeded the background concentration and the ARAR which is a state of Alaska guidance soil cleanup level for Non-UST contaminated soils (ADEC 1991).

GRPH and benzene were identified as COCs for the surface water matrix at the site. The maximum concentrations of GRPH and benzene exceeded their background concentrations and the RBSLs based on cancer. In addition, benzene exceeded the ARAR, which is an MCL promulgated under the federal Safe Drinking Water Act.

1,2-Dichloroethane was detected in one surface water sample at a concentration of 4.4 µg/L. This concentration is less than the background concentration of 1,2-dichloroethane observed at the Point Lonely installation. These detections are assumed to be the result of field decontamination procedures. The hexane and methanol used in the decontamination procedures may have contained impurities including 1,2-dichloroethane.

Table 4-10, Identification of COCs at the Diesel Spills, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, and ARARs, and identifies COCs selected in the risk evaluation.

**4.5.4.2 Exposure Pathways and Potential Receptors**. Because COCs were identified for soil/sediment and surface water at the site, the potential risks associated with ingestion of soil/sediment and surface water were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

#### 4.5.4.3 Risk Characterization.

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** The noncancer hazard associated with the ingestion of soil at the Diesel Spills by a hypothetical native northern adult/child is 0.07, and by a DEW Line worker is 0.001, based on the maximum concentrations of the COCs. The presence of DRPH and GRPH accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of soil or sediment at the site by a hypothetical native northern adult/child is $4 \times 10^{-8}$, and by a DEW Line worker is $9 \times 10^{-10}$, based on the maximum concentration of the carcinogenic COCs. The presence of GRPH and benzene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** The noncancer hazard associated with the ingestion of surface water at the Diesel Spills (SS05) site by a hypothetical native northern adult is 0.02, and by a DEW Line worker is 0.001, based on the maximum concentrations of the COC. GRPH accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of surface water at this site by a native northern adults is $1 \times 10^{-5}$, and by a DEW Line worker is $2 \times 10^{-6}$, based on the maximum concentrations of the COCs. The presence of GRPH and benzene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the soil/sediment at the Diesel Spills are the low noncancer hazard (hazard indices of 0.07 and 0.001) and the very low cancer risk associated with GRPH and benzene. These risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a potential future residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one (EPA 1991c), and on the basis of the risk assessment remediation of the site is not warranted.

The potential risks and hazards associated with the surface water at the Diesel Spills (SS05) are the very low noncancer hazard (hazard indices of 0.02 and 0.001), and low cancer risk associated with the GRPH and benzene. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-4}$ and the noncancer hazards do not exceed one (EPA 1991c), and on the basis of the risk assessment remediation of the site is not warranted. In addition, the potential risks and hazards were calculated assuming the affected surface water would be used as a sole-source water supply for 180 days per year. Based on

site-specific information, the chemicals in surface water do not currently pose a health hazard nor are they likely to pose a hazard in the future. The surface water expressions at the site are frozen most of the year; many are only intermittently filled with water during the summer months. The surface water at the site is not known to be used as a water supply now, nor has it been used in the past. In the unlikely event that surface water at the site is used as a sole-source drinking water supply in the future, a potential noncancer hazard to human health could exist if conditions remain constant.

In conclusion, under current or future uses, the COCs identified in soil/sediment and surface water at the Diesel Spills (SS05) site pose only a minimal, if any, potential threat to human health. The cancer risks and noncancer hazards calculated for soil/sediment and surface water at the site are below levels at which remediation is usually required. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 4.5.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**4.5.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. GRPH were identified as a COC in surface water, and the COCs in soils/sediments at the Diesel Spills site were DRPH, benzene, and xylenes. None of the identified COCs were associated with significant risk estimates at the Diesel Spills site.

**4.5.5.2 Summary of Ecological Risk Assessment**. Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Diesel Spills site are unlikely.

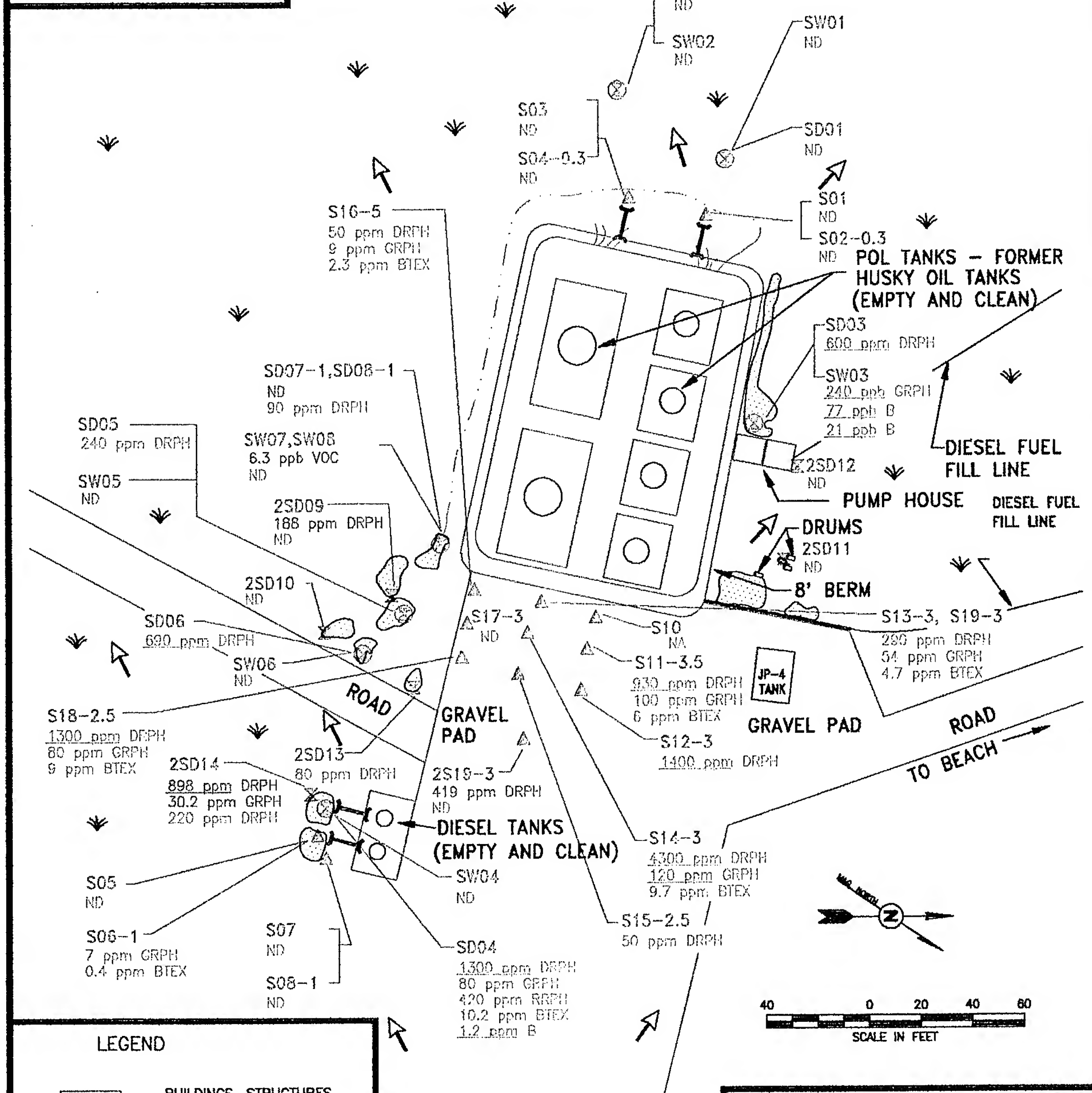
### 4.5.6 Conclusions and Recommendations

Sampling and analyses have determined that the Diesel Spills (SS05) site is contaminated primarily with petroleum hydrocarbons (DRPH, GRPH, RRPH, and BTEX). The affected areas at the site include the gravel pad and adjacent tundra south of the gravel pad.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current site uses. The potential human health risks at the site are not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential risks presented by site contaminants are low. Therefore, under current site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of DRPH, GRPH, and benzene detected in soil/sediment and levels of GRPH and benzene in surface water at the site exceed ADEC guidance cleanup levels. Therefore, the site is being recommended for remedial action. The affected area at the site includes approximately 233 cubic yards of gravel and approximately 30 cubic yards of tundra. The remedial action alternative recommended for the site is passive bioremediation. A complete description and evaluation of the remedial alternatives considered for this site are presented in the FS, Section 5.0.

DRAWING No. LONSS05




LEGEND

| | |
|---|---|
| | BUILDINGS, STRUCTURES |
| | ROADS |
| | SOIL SAMPLE |
| | SEDIMENT SAMPLE |
| | SEDIMENT AND WATER SAMPLES |
| | TUNDRA |
| | SURFACE WATER |
| | CULVERT |
| | GRAVEL PAD BOUNDARY |
| | SURFACE DRAINAGE |
| 2.6 ppm | CT&E DATA |
| 0.9 ppm | F&B DATA |

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| VOC | TOTAL VOLATILE ORGANIC COMPOUNDS |
| DRPH | DIESEL RANGE PETROLEUM HYDROCARBONS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| RRPH | RESIDUAL RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |
| B | BENZENE |

***POINT LONELY RADAR INSTALLATION***

**USAF 611th CES**

FIGURE NO. 4-5

DIESEL SPILLS (SS05) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01 | S02-0.3 | S03 | S04-0.3 | S05 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 708 | 710 | 714 | 718 | 720 | 906 | 694/696 | 684 | #5-82793 #3&4-82593 | #6-82693 #1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-10 | 50-100 | 500[a] | <190[b]-150J[b] | <50[b] | <50[b] | <50[b] | <50[b] | <100[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-1.0 | 2-10 | 100 | <20J[b]-27J[b] | <10J[b] | <2J[b] | <2J[b] | <2J[b] | <5J[b] | <100J[b] | <100[b] | <100J[b] | <50 | <2 |
| RRPH (Approx.) | 10-20 | 100-200 | 2,000[a] | <180-<670 | <100 | <100 | <100 | <100 | <200 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod) | | | 10 Total BTEX | <1.0-2.7J | <0.20J | <0.10 | <0.10 | <0.10 | <0.25 | | | | | |
| Benzene | 0.002-0.005 | 0.02-0.05 | 0.5 | <0.04-<0.3 | <0.04J | <0.02 | <0.02 | <0.02 | <0.05 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002-0.005 | 0.02-0.05 | | <0.2-0.5 | <0.04J | <0.02 | <0.02 | <0.02 | <0.05 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002-0.005 | 0.02-0.05 | | <0.2-0.2 | <0.04J | <0.02 | <0.02 | <0.02 | <0.05 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.010 | 0.04-0.10 | | <0.4-2.0J | <0.08J | <0.04 | <0.04 | <0.04 | <0.10 | <2 | <2 | <2 | <2 | <0.04 |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S06-1 | S07 | S08-1 | S11-3.5 | S12-3 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 728 | 722 4501-1 | 730 | 760 | 758 | 906 | 694/696 | 684 | #5-82793 #3&4-82593 | #6-82693 #1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 7-8 | 70-80 | 500[a] | <190[b]-150J[b] | <70[b] | <80[b] | <70[b] | 930J[b] | 1,400J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.3-5 | 3-50 | 100 | <20J[b]-27J[b] | 7J[b] | <5J[b] | <3J[b] | 100J[b] | <50J[b] | <100J[b] | <100[b] | <100J[b] | <50 | <2 |
| RRPH (Approx.) | 11-17 | 110-170 | 2,000[a] | <180-<870 | <140 | <170 | <140 | <110 | <110 | NA | <2000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod) | | | 10 Total BTEX | <1.0-2.7J | 0.4J | <0.25 | <0.15 | 6.0J | <4.52J | | | | | |
| Benzene | 0.002-0.005 | 0.02-0.05 | 0.5 | <0.04-<0.3 | <0.03 | <0.05 | <0.03 | <0.02 | <0.02J | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002-0.005 | 0.03-0.05 | | <0.2-0.5 | <0.03 | <0.05 | <0.03 | NA | <0.2J | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002-0.005 | 0.02-0.05 | | <0.2-0.2 | 0.2 | <0.05 | <0.03 | NA | <0.3J | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.006-0.010 | 0.06-0.1 | | <0.4-2.0J | 0.2J | <0.1 | <0.06 | 6.0J | <4J | <2 | <2 | <2 | <2 | <0.04 |

▒ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S13-3 & S19-3 (Replicates) | | S14-3 | S15-2.5 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 756 | 746 | 754 | 752 | 906 | 694/696 | 684 | #5-82793 #3&4-82593 | #6-82693 #1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5 | 50 | 500[a] | <190[b]-150J[b] | 280J[b] | 290J[b] | 4,300J[b] | 50J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | 54J[b] | 47J[b] | 120J[b] | <2J[b] | <100J[b] | <100[b] | <100J[b] | <50 | <2 |
| RRPH (Approx.) | 10 | 100 | 2,000[a] | <180-<670 | <100 | <100 | <100 | <100 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod) | | | 10 Total BTEX | <1.0-2.7J | 4.7J | 3.8J | 9.7 | <0.10 | | | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002 | 0.02 | | <0.2-0.5 | 0.4 | 0.3 | 0.7 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.2 | 0.3 | 0.5 | 3 | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004 | 0.04 | | <0.4-2.0J | 4J | 3J | 6J | <0.04 | <2 | <2 | <2 | <2 | <0.04 |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)
Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S16-5 | S17-3 | S18-2.5 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 750 | 748 | 732 | 906 | 694/696 | 684 | #5-82793 #3&4-82593 | #6-82693 #1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5 | 50 | 500[a] | <190[b]-150J[b] | 50J[b] | <50[b] | 1,300J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-2 | 2-20 | 100 | <20J[b]-27J[b] | 9J[b] | <20J[b] | 80J[b] | <100J[b] | <100[b] | <50[b] | <50[b] | <2 |
| RRPH (Approx.) | 10 | 100 | 2,000[a] | <180-<670 | <100 | <100 | <100 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod) | | | 10 Total BTEX | <1.0-2.7J | 2.28J | <1.0J | 9.0J | | | | | |
| Benzene | 0.002-0.02 | 0.02-0.2 | 0.5 | <0.04-<0.3 | <0.02 | <0.2J | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.5 | 0.03 | <0.2J | <0.02 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002-0.02 | 0.02-0.2 | | <0.2-0.2 | 0.25 | <0.2J | 2.0 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.04 | 0.04-0.4 | | <0.4-2.0J | 2J | <0.4J | 7.0J | <2 | <2 | <2 | <2 | <0.04 |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SD01 | SD02 | SD03 | SD04 | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 712 | 716 | 702 | 726 | 906 | 694/696 | 684 | #5-82793 #3&4-82593 | #6-82693 #1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 5-36 | 50-360 | 500[a] | <190[b]-150J[b] | <50[b] | <360[b] | 600J[b] | 1,300J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-4 | 2-40 | 100 | <20J[b]-27J[b] | <2J[b] | <7J[b] | <40J[b] | 80J[b] | <100J[b] | <100J[b] | <100J[b] | <50 | <2 |
| RRPH (Approx.) | 1-71 | 10-710 | 2,000[a] | <180-<670 | <110 | <710 | <120 | 420 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.10 | <1.20J | <4.6J | 10.2J | | | | | |
| Benzene | 0.002-0.014 | 0.02-0.14 | 0.5 | <0.04-<0.3 | <0.02 | <0.14J | <0.4J | 1.2J | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.002-0.014 | 0.02-0.14 | | <0.2-0.5 | <0.02 | <0.14J | <0.4J | 2.0 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002-0.014 | 0.02-0.14 | | <0.2-0.2 | <0.02 | <0.14J | <1.4J | 2.0 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.028 | 0.04-0.28 | | <0.4-2.0 | <0.04 | <0.28J | <2.4J | 5.0J | <2 | <2 | <2 | <2 | <0.04 |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SD05 | SD06 | SD07-1 & SD08-1 (Replicates) | | AB01 | EB02 | TB02 | | |
| Laboratory Sample ID Numbers | | | | | 698 | 686 | 724 4504-10 | 704 4506-5 | 906 | 694/696 4506-1 | 684 4505-3 | 4505/4506 #5-82793 #3&4-82593 | 4504/4506 #6-82693 #1&2-82893 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 7-13 | 70-130 | 500[a] | <190[b]-150J[b] | 240J[b] | 690J[b] | <70[b] | 90J[b] | NA | <1,000[b] | NA | <1,000 | <50 |
| GRPH | 0.2-1.0 | 2-10 | 100 | <20J[b]-27J[b] | <10J[b] | <10J[b] | <3J[b] | <2J[b] | <100J[b] | <100[b] | <100J[b] | <50 | <2 |
| RRPH (Approx.) | 13-59 | 130-590 | 2,000[a] | <180-<670 | <260 | <590 | <130 | <180 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.5 | <0.5 | <0.12 | <0.20 | | | | | |
| Benzene | 0.003-0.01 | 0.03-0.1 | 0.5 | <0.04-<0.3 | <0.1 | <0.1 | <0.03 | <0.04 | <1 | <1 | <1 | <1 | <0.02 |
| Toluene | 0.003-0.01 | 0.03-0.1 | | <0.2-0.5 | <0.1 | <0.1 | <0.03 | <0.04 | <1 | <1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.003-0.01 | 0.03-0.1 | | <0.2-0.2 | <0.1 | <0.1 | <0.03 | <0.04 | <1 | <1 | <1 | <1 | <0.02 |
| Xylenes (Total) | 0.006-0.02 | 0.06-0.2 | | <0.4-2.0J | <0.2 | <0.2 | <0.06 | <0.08 | <2 | <2 | <2 | <2 | <0.04 |
| VOC 8260 | 0.020 | 0.030-0.350 | | <0.300-2.267 | NA | NA | <0.030 | <0.35 | NA | <1 | <1 | <1 | <0.020 |
| SVOC 8270 | 0.200 | 2.00 | | <5.00-<30.0 | NA | NA | <2.00 | NA | NA | <10.2 | NA | <10 | <0.200 |
| TOC | | | | 99,600-473,000 | NA | NA | 46,100 | 437,000 | NA | <5,000 | NA | <5,000 | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely  Matrix: Soil/Sediment
Site: Diesel Spills (SS05)  Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2S19-3 | 2SD09 | 2SD10 | 2SD11 | EB05 | | |
| Laboratory Sample ID Numbers | | | | | 1787<br>4626-1 | 1788<br>4626-2 | 1789 | 1790 | 1796/1798<br>4626-6 | #6-9993<br>4626 | 4626 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | mg/kg |
| DRPH | 4.00-7 | 4.00-70 | 500[a] | <190[b]-150J[b] | 419J[ce] | 188J[ce] | <70[b] | <70[b] | <200[d] | <200-<1,000 | <4.00 |
| GRPH | 0.400 | 0.700-1 | 100 | <20J[b]-27J[b] | <1 | <0.700 | NA | NA | <20[d] | <20 | <0.400 |
| RRPH (Approx.) | 14 | 140 | 2,000[a] | <180-<670 | <140 | <140 | <140 | <140 | <2,000 | <2,000 | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c These samples were analyzed by F&B also; DRPH were detected at <80[b] mg/kg for 2S19-3 and at <70[b] mg/kg for 2SD09.
d This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L, respectively.
e The laboratory reported that the EPH pattern in this sample was not consistent with a middle distillate fuel.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)
Matrix: Sediment
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2SD12 | 2SD13 | 2SD14 | EB05 | | |
| Laboratory Sample ID Numbers | | | | | 1791 | 1792 | 1793 4626-5 | 1796/1798 4626-6 | #6-9993 #1&2-9793 | 4626 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | mg/kg |
| DRPH | 4.00-9 | 4.00-90 | 500[a] | <190[b]-150J[b] | <90[b] | 80J[b] | 898[ce] | <200[d] | <200-<1,000 | <4.00 |
| GRPH | 0.400 | 0.400 | 100 | <20J[b]-27J[b] | NA | NA | 30.2 | <20[d] | <20-<50 | <0.400 |
| RRPH (Approx.) | 12-20 | 120-200 | 2,000[a] | <180-<670 | <200 | <120 | <140 | <2,000 | <2,000 | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH were detected at 220J[b] mg/kg.
d This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L, respectively.
e The laboratory reported that the 188 mg/kg of the EPH pattern in this sample was not consistant distillate fuel.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | SW03 | SW04 | SW05 | AB01 | EB02 | TB02 | |
| Laboratory Sample ID Numbers | | | | | 658 660 | 667 668 | 675 678 | 679 680 | 762/764 767 | 906 | 694 696 | 684 | #5-82793 #3&4-82593 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | <1,000[b] | NA | <1,000[b] | NA | <1,000 |
| GRPH | 10 | 100 | | <100J[b] | <100J[b] | <100J[b] | 240J[ab] | <100J[b] | <100[b] | <100J[b] | <100J[b] | <100J[b] | <50 |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | <2,000 | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | 21 | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | 10J | <1 | <1 | <1 | <1 | <1 | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | <2 | 46J | <2 | <2 | <2 | <2 | <2 | <2 |

▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a Total petroleum hydrocarbons in this water sample exceed the 15 µg/L stated for fresh water in ADEC's Water Quality Criteria 18AAC7O (ADEC 1989).
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-9. DIESEL SPILLS ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Diesel Spills (SS05)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW06 | SW07 & SW08 (Duplicates) | | AB01 | EB02 | TB02 | |
| Laboratory Sample ID Numbers | | | | | 772 774 | 738/739 4505-1 | 742/745 4505-2 | 906 | 694/696 4506-1 | 684 4505-3 | #5-82793 #3&4-82593 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000b | <1,000b | <1,000b | <1,000b | NA | <1,000b | NA | <1,000 |
| GRPH | 10 | 100 | | <100Jb | <100b | <100b | <100b | <100Jb | <100b | <100Jb | <50 |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | <2,000 | NA | <2,000 | NA | <200 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| VOC 8260 | | | | | | | | | | | |
| Chloromethane | 1 | 1 | | <1 | NA | <1J | 2.3J | NA | <1 | <1 | <1 |
| 1,2-Dichloroethane | 1 | 1 | 5 | 4.9-7.9 | NA | 4.4 | 4J | NA | <1 | <1 | <1 |
| SVOC 8270 | 10 | 11 | | <10.2-<11 | NA | <11-<11J | <11-<11J | NA | <10.2-<10.2J | NA | <10 |
| TOC | 5,000 | 5,000 | | 25,200-28,700 | NA | 178,000 | 254,000 | NA | <5,000 | NA | <5,000 |
| TSS | 100 | 100 | | 5,000-12,000 | NA | 1,440,000 | 8,260,000 | NA | NA | NA | <100 |
| TDS | 10,000 | 10,000 | | 253,000-424,000 | NA | 298,000 | 326,000 | NA | NA | NA | 12,000 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

## TABLE 4-10. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE DIESEL SPILLS (SS05)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| **Diesel Spills** (SS05) | Soil or Sediment | DRPH | 4,300J | mg/kg | <190-150J | -- | -- | 500[c] | **Yes** |
| | | GRPH | 120J | mg/kg | <20J-27J | -- | -- | 100[c] | **Yes** |
| | | RRPH | 420 | mg/kg | <180-<670 | -- | -- | 2,000[c] | No |
| | | Benzene | 1.2J | mg/kg | <0.04-<0.5 | 2.2 | -- | 0.5[c] | **Yes** |
| | | Toluene | 2.0 | mg/kg | <0.2-0.5 | -- | 5,400 | -- | No |
| | | Ethylbenzene | 3 | mg/kg | <0.2-0.2 | -- | 2,700 | -- | No |
| | | Xylenes (Total) | 7.0J | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | Surface Water | GRPH | 240J | µg/L | <50-<100 | 50 | 730 | -- | **Yes** |
| | | Benzene | 21 | µg/L | <1 | 0.617 | -- | 5[d] | **Yes** |
| | | Ethylbenzene | 10J | µg/L | <1 | -- | 158 | 700[e] | No |
| | | Xylenes (total) | 46J | µg/L | <2 | -- | 7,300 | 10,000[e] | No |
| | | Chloromethane | 2.3J | µg/L | <1 | 6.54 | -- | -- | No |
| | | 1,2-Dichloroethene | 4.4B | µg/L | 4.9-7.9 | 0.934 | -- | 5[d] | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
e MCL, 56 FR 3526 (30 January 1991).
B The analyte was less than five times the range of the concentrations detected in background surface water samples and equipment blanks; therefore, 1,2-dichloroethane is not considered a COC.
J Result is an estimate.
--- Not applicable.

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## 4.6 GARAGE (SS09)

### 4.6.1 Site Background

The Garage (SS09) site is located approximately 100 feet northeast of the module train. The Garage is an approximately 100-foot by 40-foot building elevated about three feet above the tundra and is surrounded by gravel on all sides. The building was used for vehicle maintenance and storage. Floor drains in this building discharged directly to the tundra beneath the structure and may have received vehicle maintenance waste; however, the site has been inactive since 1989. Culverts lead from under the Garage to the tundra north and west of the gravel pad surrounding the Garage.

Previous sampling, conducted in 1989 by an Air Force contractor, detected petroleum hydrocarbons (TPH) and associated SVOCs in soil at the site. A detailed list of contaminants and concentrations previously detected is presented in the RI/FS Work Plan (U.S. Air Force 1993).

The site-specific environmental setting describing the topography, surface water drainage, and soil types is presented in the discussion of potential migration pathways, Section 4.6.3.

### 4.6.2 Field Sampling and Analytical Results

This section describes the RI sampling and analytical results for samples collected at the Garage (SS09) site. The discussion presents a review of laboratory data, data summary tables, contaminants identified, contaminant trends, and information on suspected source areas.

**4.6.2.1 Summary of Samples Collected.** A total of 11 samples was collected at the site. These consisted of seven soil, two sediment, and two surface water samples. Table 2-2 presents a detailed summary of the samples collected and the analyses performed during the 1993 RI field activities. Locations of all samples collected at the Garage (SS09) site are presented in Figure 4-6.

Seven soil samples were analyzed for DRPH, GRPH, RRPH, BTEX, and HVOCs. In addition, four soil samples were analyzed for VOCs and PCBs. One soil sample was analyzed for SVOCs and total metals.

Two sediment samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, and PCBs. In addition, one sample was analyzed for VOCs, SVOCs, and total metals.

Two surface water samples were analyzed for DRPH, GRPH, RRPH, BTEX, HVOCs, VOCs, SVOCs, PCBs, and total and dissolved metals.

**4.6.2.2 Analytical Results.** The data summary table (Table 4-11) presents analytical results for all samples collected at the site. Detection and quantitation limits, action levels, associated laboratory and field blanks, and background analytical results are presented for each of the analyses. Background levels are listed to allow direct comparison of naturally occurring

organic compounds and inorganic analytes with samples collected from the site. Sample locations and analytical results for the samples at the site are illustrated in Figure 4-6. All organic compounds detected are presented on the figure except when they were a result of laboratory contamination or field decontamination procedures. Only metals detected above background that exceed an RBSL or ARAR are presented on Figure 4-6. The exceptions are presented on the data summary table.

The following section presents a discussion of organic compounds and inorganic analytes detected above background levels at the site.

**Organics**. Organic compounds detected in soil and sediment samples collected at the site include DRPH, GRPH, RRPH, BTEX compounds, and six other VOCs. DRPH were detected in four samples ranging from 90 to 16,000 mg/kg. GRPH were detected in five samples at concentrations ranging from 6 to 400 mg/kg. RRPH were detected in five soil/sediment samples ranging from 190 to 10,000 mg/kg. Total BTEX was detected in five samples ranging from 0.069 to 31 mg/kg; xylenes were the primary component. Six other VOCs were detected in four soil/sediment samples at concentrations ranging from 0.05 to 18 mg/kg; tetrachloroethene was the primary component. One SVOC, di-n-butylphthalate, was detected at low concentrations (11.9 and 15.3 mg/kg, respectively) in two soil/sediment samples and in the associated laboratory blanks.

In surface water samples, organic compounds detected include benzene, toluene, and xylenes. Benzene was detected in both surface water samples at 2 μg/L. Toluene and xylenes were both detected in surface water sample SS09-SW01 at 6 μg/L.

**Inorganics**. Metals analyses indicated that two metals (calcium and magnesium) were detected at concentrations above background levels in two soil/sediment samples at this site. Calcium was detected at 130,000 and 63,000 mg/kg in samples SS09-S05 and SS09-SD01/SD03, respectively. Magnesium was detected at 72,000 and 37,000 mg/kg in the same respective samples.

In surface water samples, metals analysis detected two metals (barium and potassium) at levels above background concentrations in surface water samples SS09-SW01 and SS09-SW02. Barium was detected at 290 and 250 μg/L, respectively. Potassium was detected at 11,000 and 9,300 μg/L, respectively.

**4.6.2.3 Summary of Site Contamination**. Previous sampling conducted at the Garage (SS09) detected petroleum hydrocarbons (TPH) and two SVOCs in the soil at the site. The results and sources of previous sampling efforts are presented in the RI/FS Work Plan (U.S. Air Force 1993a). The quality of the previous IRP sampling data is unknown as is the data validation, if any, that these data have undergone.

During previous sampling conducted in 1989, TPH was detected in a soil sample at 13,000 mg/kg, and two SVOCs that are common components of petroleum products (fluoranthene and pyrene) were detected an very low levels (0.014 and 0.011 mg/kg, respectively).

A comparison of historical and current project data indicates that there is a higher concentration of petroleum hydrocarbons in soil than there has been in the past. Maximum concentrations of similar compounds detected in soil during the 1993 RI include DRPH at 16,000 mg/kg, GRPH at 400 mg/kg, RRPH at 10,000 mg/kg, and BTEX at 31 mg/kg. In addition, BTEX compounds were detected at very low concentrations in surface water. Differences between past and current data are likely to be a result of more extensive sampling during the 1993 RI. The human health and ecological risks associated with chemicals detected at the site are presented in Section 4.6.4 and 4.6.5. The suspected source of contaminants detected during sampling conducted at the Garage is POL wastes discharged to floor drains in the Garage. The Garage has been inactive since 1989.

Based on field data, source of contamination, and concentration of contaminants, the contaminated area at the site is limited to approximately 4,500 square feet below the structure.

### 4.6.3 Migration Pathways

This section describes the topography and stratigraphy of the site and the migration potential of contaminants from the site. A discussion of receptors and chemical concentrations at receptors is included.

**4.6.3.1 Topography and Stratigraphy**. The Garage (SS09) site consists of the garage building, the surrounding gravel pad, ponds, and tundra (Figure 4-6). The topography in this area is relatively flat, and most relief is from gravel pads and roads. Ponded areas are located immediately west and north of the gravel pad that surrounds the Garage. The area under the Garage drains to both the west and northwest ponds via culverts placed under the gravel pad. The general drainage from the tundra surrounding the Garage is to the north.

During the 1993 RI, permafrost was located at a depth of approximately two feet in tundra areas and four feet under gravel pads. Gravel pads consisted of the typical gravels and sands associated with these features, and subsurface tundra materials were of the typical stratigraphy associated with these features (Section 2.4.4.2).

#### 4.6.3.2 Migration Potential.

**Subsurface Migration**. Analytical results indicate that minimal migration of contaminants has occurred at the site. Below the Garage contaminants have migrated into the subsurface soils to a depth of at least one foot. Low concentrations of contaminants detected outside the gravel pad area indicate that the potential for subsurface migration from below the Garage to surrounding areas is minimal.

**Surface Migration**. The topography at the site dictates that drainage should be toward the west and northwest, through the culverts to the tundra. Migration in the tundra is through ephemeral streams connecting tundra ponds. There are no distinct streams or drainages in the area. An abundant supply of water is available during the spring thaw, when melting snow and ice provide more water than can infiltrate into the soil; at these times surface water features may drain overland into the lagoon northeast of the site. Analytical data indicate surface water, soil, and

sediment directly below the culverts contain low levels of petroleum compounds (DRPH, GRPH, and RRPH) and associated VOCs, but that minimal migration has occurred.

**Air Transport**. Air transportation is not considered to be a significant mode of migration at the site (Section 2.4.4.5).

**Summary of Migration Potential**. Although some subsurface soils at the site contained petroleum hydrocarbons (DRPH, GRPH, and RRPH) and VOCs (including BTEX) at concentrations that exceed guidance levels, the flat topography and surrounding gravel pad suggests that the potential for significant migration in active layer water is limited. Contaminants were detected at very low concentrations in surface water, soil, and sediment samples just below the culverts that drain the area below the Garage. There are no distinct drainage pathways leading from the tundra area. The surrounding tundra is saturated and migration could occur through the marshy terrain. Analytical results, however, indicate significant contaminant migration is not occurring, and the potential for migration in surface water is considered to be low.

#### 4.6.3.3 Receptors and Chemical Concentrations at Receptors.

**Human Receptors**. Potential human receptors at the Garage (SS09) site include Air Force contractor personnel periodically working at the station, visitors to the station, and an occasional local visitor passing the site to get to recreational or subsistence lands. Human receptors could potentially be exposed to the chemicals detected in surface water and soil/sediments at the site. The primary routes of potential exposures at the site are direct contact with soil/sediment, incidental ingestion of soil/sediment, and ingestion of surface water. Because ground water and air at the Point Lonely sites are not considered complete pathways of exposure, these media are not evaluated as potential pathways to human receptors.

The Point Lonely Risk Assessment (U.S. Air Force 1996) evaluates in detail the risks to human health from all COCs detected at the site. The potential receptor groups were selected based on their likelihood of exposure to contaminants at the site and include DEW Line workers at the installation, and native adults and children who may visit the site. The estimated exposure point concentrations for human receptors are based on the maximum concentration of each chemical detected at the site. The potential risks to human health associated with chemicals at the site are presented in Section 4.6.4.

**Ecological Receptors**. Ecological receptors were evaluated in detail in the Point Lonely Risk Assessment (U.S. Air Force 1996) to determine if plants and animals could potentially be impacted by the chemicals detected at the Point Lonely installation. Because of the diversity of the plants and animals in the area of the Point Lonely installation, a set of representative species was selected in the ERA for detailed evaluation. The species include plants, aquatic invertebrates, fish, birds, and mammals. These receptors were selected based on the species' likelihood of exposure given their preferred habitat and feeding habits. The representative species encompass a range of ecological niches in order to achieve the best characterization of the ecosystems being examined and are presented in Tables 2-6 and 2-7.

The estimate of chemical concentrations at the ecological receptors was based on the average site-wide concentration of each COC. This approach was appropriate because few of the representative species would inhabit only one distinct site at the installation; they are more likely to be exposed to the mix of chemicals and concentrations detected on all the sites at Point Lonely. The potential ecological risks associated with the chemicals detected at the site are presented in Section 4.6.5.

### 4.6.4 Human Health Risk Assessment

This section presents a summary of the potential human health risks associated with the chemicals detected at the Garage (SS09) site. The purpose of the human health risk assessment is to quantify the excess lifetime cancer risk and/or the noncancer hazard (reported as hazard index) from the contaminants detected at the site.

This summary presents the COCs at the site, the pathways by which human receptors may be exposed to site chemicals, potential risks to human health posed by each chemical through each exposure pathway, the significance of the risk and/or hazard estimate, and a comparison of site chemical concentrations to ARARs. The methods and assumptions used in calculating hazards and risks are presented in Section 2.4.1.

**4.6.4.1 Chemicals of Concern**. DRPH, GRPH, RRPH, and tetrachloroethene were identified as COCs for the soil matrix at the Garage. The maximum concentrations of DRPH, GRPH, and RRPH exceeded their background concentrations and the ARAR concentrations for petroleum hydrocarbon contamination of soil. The maximum concentration of tetrachloroethene exceeded the background concentration, and the RBSLs based on cancer risk.

Benzene and barium were identified as COCs for the surface water matrix at the site. The maximum concentration of benzene exceeded the background concentration and the RBSL. The maximum concentration of barium exceeded the background concentration and the RBSL based on noncancer hazard.

Table 4-12, Identification of COCs at the Garage, presents the maximum concentrations of chemicals detected at the site, the associated background concentrations, RBSLs, ARARs, and identifies COCs selected in the risk evaluation.

**4.6.4.2 Exposure Pathways and Potential Receptors**. Because COCs were identified for soil/sediment and surface water at the site, the potential risks associated with ingestion of soil/sediment and surface water were evaluated in the risk assessment.

Three potential receptor groups were evaluated in the risk assessment: an adult assigned to a DEW Line installation (worker), an adult inhabitant of communities in the North Slope of Alaska (native), and a child living in a North Slope community (child).

#### 4.6.4.3 Risk Characterization.

**Noncancer Hazard and Cancer Risk Associated with Soils and Sediments.** The noncancer hazard associated with the ingestion of soil at the Garage by a hypothetical native northern adult/child is 0.4, and by a DEW Line worker is 0.009, based on the maximum concentrations of the COCs. The presence of DRPH, GRPH, RRPH, and tetrachloroethene accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations. DRPH and RRPH together account for more than 90 percent of the noncancer hazard.

The excess lifetime cancer risk associated with the ingestion of soil or sediment at the site by a hypothetical native northern adult/child is $3 \times 10^{-7}$, and by a DEW Line worker is $6 \times 10^{-9}$, based on the maximum concentration of the carcinogenic COCs. The presence of GRPH and tetrachloroethene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Noncancer Hazard and Cancer Risk Associated with Surface Water.** The noncancer hazard associated with the ingestion of surface water at the Garage (SS09) site by a hypothetical native northern adult is 0.06, and by a DEW Line worker is 0.005, based on the maximum concentrations of the COC. Barium accounts entirely for the quantifiable noncancer hazard for these receptor/pathway combinations.

The excess lifetime cancer risk associated with the ingestion of surface water at this site by a native northern adults is $6 \times 10^{-7}$, and by a DEW Line worker is $9 \times 10^{-9}$, based on the maximum concentrations of the COC. The presence of benzene accounts entirely for the quantifiable excess lifetime cancer risk for these receptor/pathway combinations.

**Summary of Human Health Risk Assessment.** The potential risks and hazards associated with the soil/sediment at the Garage are the low noncancer hazard (hazard indices of 0.4 and 0.009) and the very low cancer risk associated with GRPH and tetrachloroethene. These risks and hazards were calculated conservatively based on ingestion of soil at a rate associated with a potential future residential scenario. It is very unlikely that the soil at this location would be ingested at the conservative rate used in the risk calculation, and the hazards and risks at the site are likely to be overestimated. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one (EPA 1991c), and on the basis of the risk assessment remediation of the site is not warranted.

The potential risks and hazards associated with the surface water at the Garage (SS09) are the very low noncancer hazard (hazard indices of 0.06 and 0.005), and low cancer risk associated with the benzene. Remedial action is generally not warranted at sites where the excess lifetime cancer risk is less than $1 \times 10^{-6}$ and the noncancer hazards do not exceed one, and on the basis of the risk assessment remediation of the site is not warranted. In addition, the potential risks and hazards were calculated assuming the affected surface water would be used as a sole-source water supply for 180 days per year. Based on site-specific information, the chemicals in surface water do not currently pose a health hazard nor are they likely to pose a hazard in the future. The surface water expressions at the site are frozen most of the year; many are only intermittently filled with water during the summer months. The surface water at the site is not

known to be used as a water supply now, nor has it been used in the past. In the unlikely event that surface water at the site is used as a sole-source drinking water supply in the future, a potential noncancer hazard to human health could exist if conditions remain constant.

In conclusion, under current or future uses, the COCs identified in soil/sediment and surface water at the Garage (SS09) site pose only a minimal, if any, potential threat to human health. The cancer risks and noncancer hazards calculated for soil/sediment and surface water at the site are below levels at which remediation is usually required. Based on the human health risk assessment, remedial actions are not warranted at the site.

### 4.6.5 Ecological Risk Assessment

The objective of the ERA is to estimate the potential impacts of chemicals detected at the Point Lonely installation to aquatic and terrestrial plants and animals. A summary of the methods used to assess potential ecological impacts is presented in Section 2.4.2.

**4.6.5.1 Chemicals of Concern**. COCs were selected based on criteria presented in Section 3.1 of the ERA. The average installation-wide concentrations of COCs were used to calculate the risk estimates. All sites at the installation were considered as potentially usable habitat. It should be noted that the COC selection process only considered the soil/sediment samples that were at or less than 1.5 feet deep. The soil/sediment samples were screened for depth because it is unlikely that any of the representative species will be exposed to soils/sediments deeper than 1.5 feet. No COCs were identified in surface water at the Garage site. The COCs identified in soil/sediments at the site were DRPH, GRPH, RRPH, benzene, and xylenes. None of the identified COCs were associated with significant risk estimates at the Garage site.

**4.6.5.2 Summary of Ecological Risk Assessment**. Based on the quantification of potential risks to ecological receptors and discussions presented in the Point Lonely ERA, ecological risks at the Garage site are unlikely.

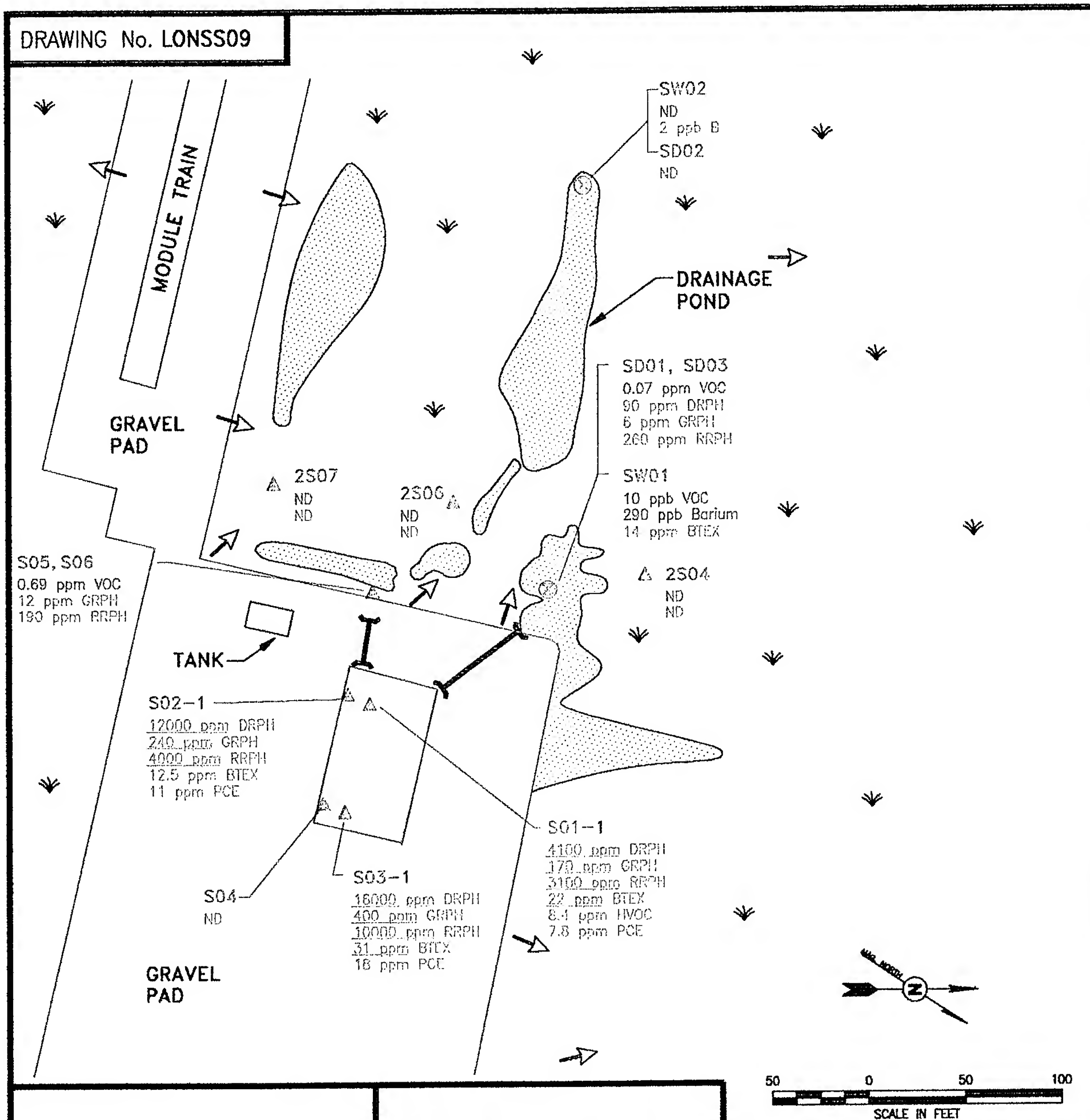
### 4.6.6 Conclusions and Recommendations

Sampling and analyses have determined that the Garage (SS09) site is contaminated with petroleum hydrocarbons (DRPH, GRPH, and RRPH), BTEX compounds, and other VOCs. Some metals (inorganics) detected at the site at slightly elevated levels are also considered to be COCs. The contaminated areas at the site are soil/sediment and surface water. The soil/sediment areas beneath the site building have the highest concentrations of contaminants. The source of contamination is suspected to be POL wastes discharged to floor drains in the Garage.

Migration of contaminants from the site appears to be very limited. Contaminants detected in the sediment sample collected from the mouth of the west culvert leading from the Garage were similar to those detected below the Garage building, however, concentrations were much lower. Contaminants were not detected in a drainage pathways downgradient of the culverts indicating that contaminant migration is minimal.

The risk assessment concluded that risks posed to human health and ecological receptors by site contaminants are minimal given current or future site uses. This human health risk is not of a magnitude that normally requires remedial action. The ERA concluded that the overall potential hazard from site contaminants is low. Therefore, under current site conditions and considering the findings of the risk assessment, remediation of the site is not necessarily warranted.

Levels of petroleum compounds (primarily DRPH, GRPH, and RRPH) and BTEX detected in soil/sediment at the site, however, significantly exceed ADEC guidance cleanup levels. Therefore the suspected source area at site, the area beneath the building, is being recommended for remedial action. The contaminated area at the site consists of approximately 167 cubic yards of soil beneath the building. The remedial action alternative recommended for beneath the building is passive bioremediation. A complete description and evaluation of the remedial alternative recommended for this site are presented in the Feasibility Study, Section 5.0.




LEGEND

- BUILDINGS, STRUCTURES
- ROADS
- SOIL SAMPLE
- SEDIMENT AND WATER SAMPLES
- TUNDRA
- SURFACE WATER
- CULVERT
- GRAVEL PAD BOUNDARY
- SURFACE DRAINAGE
- 2.6 ppm — CT&E DATA
- 0.9 ppm — F&B DATA

| | |
|---|---|
| 0000 | CONCENTRATIONS ARE ABOVE ACTION LEVELS |
| ND | NO CONTAMINATION DETECTED |
| SVOC | TOTAL SEMI-VOLATILE ORGANIC COMPOUNDS |
| VOC | TOTAL VOLATILE ORGANIC COMPOUNDS |
| DRPH | DIESEL RANGE PETROLEUM HYDROCARBONS |
| GRPH | GASOLINE RANGE PETROLEUM HYDROCARBONS |
| RRPH | RESIDUAL RANGE PETROLEUM HYDROCARBONS |
| BTEX | TOTAL BTEX COMPOUNDS |
| HVOC | TOTAL HALOGENATED VOLATILE ORGANIC COMPOUNDS |
| B | BENZENE |
| PCE | TETRACHLOROETHENE |

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 4-6

GARAGE (SS09) SAMPLE LOCATIONS AND ANALYTICAL RESULTS

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# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01-1 | S02-1 | S03-1 | S05 & S06 (Replicates) | | AB02 | EB04 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 998 | 1000 | 1004 | 1006 4427-1 | 1008 | 1094 | 1100 1098 4426-4 | 1092 4426-3 | #5-83093 #1&2-82893 4426 | #6-82893 #3&4-83193 4427 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 6-25 | 60-250 | 500[a] | <190[b]-150J[b] | 4,100J[b] | 12,000J[b] | 18,000J[b] | <80J[b] | <100[b] | NA | <1,000J[b] | NA | <1,000 | <50 |
| GRPH | 0.1-0.5 | 2-5 | 100 | <20J[b]-27J[b] | 170J[b] | 240J[b] | 400J[b] | <2J[b] | 12J[b] | <50J[b] | <50J[b] | <50J[b] | NA | <2 |
| RRPH (Approx.) | 11-50 | 110-500 | 2,000[a] | <180-<670 | 3,100 | 4,000 | 10,000 | <110 | 190 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | 22.02J | 12.5J | 30.98J | <0.10 | <0.52 | | | | | |
| Benzene | 0.002-0.01 | 0.02-0.1 | 0.5 | <0.04-<0.3 | 0.28J | 0.1J | <0.1 | <0.02 | <0.04 | <1 | <2J | <6J | <1 | <0.02 |
| Ethylbenzene | 0.002-0.01 | 0.02-0.1 | | <0.2-0.5 | 6 | 1J | 0.9 | <0.02 | <0.04 | <1 | <2J | <4J | <1 | <0.02 |
| Toluene | 0.002-0.01 | 0.02-0.1 | | <0.2-0.2 | 0.74 | 0.4J | 0.08J | <0.02 | <0.04 | <1 | <2J | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.02 | 0.04-0.2 | | <0.4-2.0J | 15J | 11J | 30J | <0.04 | <0.4 | <2 | <2J | <3J | <2 | <0.04 |
| HVOC 8010 | | | | | | | | | | | | | | |
| Carbon Tetrachloride | 0.002-0.004 | 0.02-0.04 | | <0.04-<0.3 | 0.05J | <0.02 | <0.02 | <0.02 | <0.04 | <1 | <1 | <1 | NA | <0.02 |
| Tetrachloroethene | 0.002-0.004 | 0.02-0.04 | | <0.04-<0.3 | 7.8J | 11J | 18J | <0.02 | <0.04 | <1 | <1 | <1 | NA | <0.02 |
| Trichloroethene | 0.002-0.05 | 0.02-0.5 | | <0.04-<0.3 | 0.5J | <0.02 | <0.02 | <0.02 | <0.04 | <1 | <1 | <1 | NA | <0.02 |
| VOC 8260 | | | | | | | | | | | | | | |
| Naphthalene | 0.020 | 0.050 | | <0.300-0.211 | NA | NA | NA | 0.173 | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,2,4-Trimethylbenzene | 0.020 | 0.050 | | <0.300-0.956 | NA | NA | NA | 0.098 | NA | NA | <1 | <1 | <1 | <0.020 |
| 1,3,5-Trimethylbenzene | 0.020 | 0.050 | | <0.300-0.409 | NA | NA | NA | 0.227 | NA | NA | <1 | <1 | <1 | <0.020 |
| Xylenes (Total) | 0.020 | 0.100 | | <0.600-2.267 | NA | NA | NA | 0.191 | NA | NA | <1 | <2 | <2 | <0.040 |

□ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Soil
Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S01-1 | S02-1 | S03-1 | S05 & S06 (Replicates) | | AB02 | EB04 | TB04 | | |
| Laboratory Sample ID Numbers | | | | | 998 | 1000 | 1004 | 1006 4427-1 | 1008 | 1094 | 1100 1098 4426-4 | 1092 4426-3 | 4426 | #6-82893 4427 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| SVOC 8270 | | | | | | | | | | | | | | |
| di-n-Butylphthalate | 0.200 | 7.20 | 8,000 | <5.00-<30.0 | NA | NA | NA | 11.9B | NA | NA | <26 | NA | <10 | 1.610 |
| PCBs | 0.01 | 0.1 | 10 | <0.1-<0.7 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | NA | <2 | NA | NA | <0.1 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
B Analyte was detected in the associated lab blank.

# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely    Matrix: Sediment
Site: Garage (SS09)    Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples: SD01 & SD03 (Replicates) | | Environmental Samples: SD02 | Field Blanks: AB02 | Field Blanks: EB04 | Field Blanks: TB04 | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Laboratory Sample ID Numbers | | | | | 1022 4427-2 | 1020 4427-3 | 1034 | 1094 | 1098 1100 4426-4 | 1092 4426-3 | #5-83093 #1&2-82893 4426 | #6-82993 #3&4-83193 #1&2-82893 4427 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | µg/L | µg/L | mg/kg |
| DRPH | 9 | 90 | 500[a] | <190[b]-<150J[b] | NA | 90J[b] | <90J[b] | NA | <1,000J[b] | NA | <1,000 | <50 |
| GRPH | 0.2 | 2 | 100 | <20J[b]-27J[b] | <2J[b] | 6J[b] | <2J[b] | <50J[b] | <50J[b] | <50J[b] | NA | <2 |
| RRPH(Approx.) | 13 | 130 | 2,000[a] | <180-<670 | NA | 260 | <130 | NA | <2,000 | NA | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <2.6 | <2.6 | <0.1 | | | | | |
| Benzene | 0.002 | 0.02 | 0.5 | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <1 | <2J | <6J | <1 | <0.02 |
| Ethylbenzene | 0.002 | 0.02 | | <0.2-0.5 | <0.02 | <0.02 | <0.02 | <1 | <2J | <4J | <1 | <0.02 |
| Toluene | 0.002 | 0.02 | | <0.2-0.2 | <0.02 | <0.02 | <0.02 | <1 | <2J | <3J | <1 | <0.02 |
| Xylenes (Total) | 0.004-0.02 | 0.04-0.2 | | <0.4-2.0J | <0.20 | <0.20 | <0.04 | <2 | <2J | <3J | <2 | <0.04 |
| HVOC 8010 | 0.002 | 0.2 | | <0.04-<0.3 | <0.02 | <0.02 | <0.02 | <1 | <1.0 | <1.0 | NA | <0.02 |
| VOC 8260 | | | | | | | | | | | | |
| Xylenes (Total) | 0.040 | 0.040 | | <0.600-2.267 | 0.045 | 0.069J | NA | NA | <2 | <2 | <2 | <0.040 |
| SVOC 8270 | | | | | | | | | | | | |
| di-n-Butylphthalate | 0.200 | 0.200-3.30 | 8,000 | <5.00-<30.0 | 15.3B | 2.13U | NA | NA | <26 | NA | <10 | 1.610 |
| PCBs | 0.01 | 0.1 | 10 | <0.1-<0.7 | NA | <0.1 | <0.1 | NA | <2 | NA | NA | <0.1 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
B Analyte was detected in the associated blank.
J Result is an estimate.
U Compound is not present above the concentration listed.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely  Matrix: Soil
Site: Garage (SS09)  Units: mg/kg

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | Field Blank | Lab Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2S04 | 2S06-1 | 2S07 | EB08 | | |
| Laboratory Sample ID Numbers | | | | | 1756 4626-7 | 1758 4626-8 | 1760 4626-11 | 1774 1776 4626-11 | #6-9993 #5-83093 #1&2-9793 #1&2-82893 4626 | #5-9693 #1&2-9793 4626 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | µg/L | µg/L | mg/kg |
| DRPH | 6-25 | 60-250 | 500[a] | <190[b]-150J[b] | <250[b] | <60[b] | <250[b] | 289J[cd] | <200-<1,000 | <50 |
| GRPH | 0.1-0.5 | 1-5 | 100 | <20J[b]-27J[b] | <5[b] | <1J[b] | <5J[b] | <20[c] | <20 | <1 |
| RRPH (Approx.) | 12-50 | 120-500 | 2,000[a] | <180-<670 | <500 | <120 | <500 | <2,000 | <2,000 | <100 |
| BTEX (8020/8020 Mod.) | | | 10 Total BTEX | <1.0-2.7J | <0.5 | <0.1 | <0.5 | | | |
| Benzene | 0.002-0.01 | 0.02-0.1 | 0.5 | <0.04-<0.3 | <0.1 | <0.02 | <0.1 | <1 | <1 | <0.02 |
| Ethylbenzene | 0.002-0.01 | 0.02-0.1 | | <0.2-0.5 | <0.1 | <0.02 | <0.1 | <1 | <1 | <0.02 |
| Toluene | 0.002-0.01 | 0.02-0.1 | | <0.2-0.2 | <0.1 | <0.02 | <0.1 | <1 | <1 | <0.02-<0.03 |
| Xylenes (Total) | 0.004-0.02 | 0.04-0.2 | | <0.4-2.0J | <0.2 | <0.04 | <0.1 | <2 | <2 | <0.04-<0.09 |
| HVOC 8010 | 0.02-0.05 | 0.2-0.5 | | <0.04-<0.3 | <0.5 | <0.2 | <0.5 | <10 | <1-<10 | <0.04-<0.2 |
| VOC 8260 | 0.020 | 0.025-0.400 | | <0.300-<0.500 | <0.025J | <0.220 | <0.400 | <1-3.9 | <1 | <0.020 |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
a The action levels for DRPH and RRPH are based on conversations with ADEC; final action levels have not yet been determined.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.
c This sample was analyzed by F&B also; DRPH and GRPH were detected at <1,000[b] and <50[b] µg/L; respectively.
d The laboratory reported that the EPH pattern in this sample was not consistant with a middle distillate fuel.

## TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Soil/Sediment
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Samples | | | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S05 | SD01 & SD03 (Replicates) | | | | EB04 | |
| Laboratory Sample ID Numbers | | | | | 4427-1 | 4427-2 | 4427-3 | | | 4426-4 | 4427 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L |
| Aluminum | 0.35 | 2 | | 1,500-25,000 | 2,900 | 2,100 | 1,800J | | | <100 | <100 |
| Antimony | N/A | 49-93 | | <7.8-<230 | <93 | <49 | <54 | | | <100 | <100 |
| Arsenic | 0.11 | 49-93 | | <4.9-8.5 | <93 | <49 | <54 | | | <100 | <100 |
| Barium | 0.024 | 1 | | 27-390 | 86 | 50 | 64J | | | <50 | <50 |
| Beryllium | N/A | 25-46 | | <2.6-6.4 | <46 | <25 | <27 | | | <50 | <50 |
| Cadmium | 0.33 | 2.5-4.6 | | <3.0-<36 | <4.6 | <2.5 | <2.7 | | | <50 | <50 |
| Calcium | 0.69 | 4 | | 360-59,000 | 130,000 | 39,000 | 63,000J | | | <200 | <200 |
| Chromium | 0.066 | 2.5-4.6 | | <4.3-47 | <4.6 | <2.5 | <2.7 | | | <50 | <50 |
| Cobalt | N/A | 4.9-9.3 | | <5.1-12 | <9.3 | <4.9 | <5.4 | | | <100 | <100 |
| Copper | 0.045 | 1 | | <2.7-45 | 12 | 5.4 | 6.3 | | | <50 | <50 |
| Iron | 0.50 | 2 | | 5,400-35,000 | 15,000 | 9,500 | 8,800 | | | 120 | <100 |
| Lead | 0.13 | 4.9-9.3 | | <5.1-22 | <9.3 | <4.9 | <5.1 | | | <100 | <100 |
| Magnesium | 0.96 | 4 | | 360-7,400 | 72,000 | 22,000 | 37,000J | | | <200 | <200 |
| Manganese | 0.025 | 1 | | 25-290 | 200 | 91 | 110J | | | <50 | <50 |
| Molybdenum | N/A | 2.5-4.6 | | <2.5-<11 | <4.6 | <2.5 | <2.7J | | | <50 | <50 |
| Nickel | 0.11 | 1 | | 4.2-46 | 7 | 4.4 | 4 | | | <50 | <50 |

☐ CT&E Data.
▩ F&B Data.
N/A Not available.
J Result is an estimate.

## TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Soil/Sediment
Units: mg/kg

METALS ANALYSES

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Samples | | | | | Field Blank | Lab Blank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S05 | SD01 & SD03 (Replicates) | | | | EB04 | |
| Laboratory Sample ID Numbers | | | | | 4427-1 | 4427-2 | 4427-3 | | | 4426-4 | 4427 |
| ANALYSES | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | | | µg/L | µg/L |
| Potassium | 23 | 100 | | <300-2,200 | 640 | 330 | 380 | | | <5,000 | <5,000 |
| Selenium | 1.2 | 49-93 | | <7.8-<170 | <93 | <49 | <54 | | | <100 | <100 |
| Silver | 0.53 | 2.5-4.6 | | <3-<110 | <2.5 | <2.7 | <2.7J | | | <50 | <50 |
| Sodium | 0.55 | 5 | | <160-680 | 310 | 220 | 200 | | | <250 | <250 |
| Thallium | 0.011 | 0.25-0.47 | | <0.2-<1.2 | <0.47 | <0.25 | <0.26 | | | <5 | <5 |
| Vanadium | 0.036 | 0.1 | | 6.3-59 | 26 | 14 | 15 | | | <50 | <50 |
| Zinc | 0.16 | 1 | | 9.2-95 | 19 | 14 | 11 | | | <50 | <50 |

☐ CT&E Data.
J Result is an estimate.

# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Surface Water
Units: µg/L

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Levels | Environmental Samples | | | | | Field Blanks | | | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | | | | AB02 | EB04 | TB04 | |
| Laboratory Sample ID Numbers | | | | | 1010<br>1012<br>4427-4 | 1016<br>1018<br>4427-5 | | | | 1094 | 1098<br>1100<br>4426-4 | 1092<br>4426-3 | #5-83093<br>#1&2-82893<br>4427 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L | µg/L | µg/L |
| DRPH | 100 | 1,000 | | <1,000[b] | <1,000J[b] | <1,000J[b] | | | | NA | <1,000J[b] | NA | <1,000 |
| GRPH | 5 | 50 | | <100J[b] | <50J[b] | <50J[b] | | | | <50J[b] | <50J[b] | <50J[b] | NA |
| RRPH (Approx.) | 200 | 2,000 | | <2,000 | <2,000 | <2,000 | | | | NA | <2,000 | NA | <2,000 |
| BTEX (8020/8020 Mod.) | | | | | | | | | | | | | |
| Benzene | 0.1 | 1 | 5 | <1 | 2J | 2J | | | | <1 | <2J | <6J | <1 |
| Toluene | 0.1 | 1 | 1,000 | <1 | 6 | <1 | | | | <1 | <2J | <4J | <1 |
| Ethylbenzene | 0.1 | 1 | 700 | <1 | <1 | <1 | | | | <1 | <2J | <3J | <1 |
| Xylenes (Total) | 0.2 | 2 | 10,000 | <2 | 6J | <2 | | | | <2 | <2J | <3J | <2 |
| HVOC 8010 | 0.1 | 1 | | <1 | <1 | <1 | | | | NA | <1 | <1 | NA |
| VOC 8260 | | | | | | | | | | | | | |
| Benzene | 1 | 1 | 5 | <1 | 1.5 | <1 | | | | NA | <1 | <1 | <1 |
| Toluene | 1 | 1 | 1,000 | <1 | 4.8 | <1 | | | | NA | <1 | <1 | <1 |
| Xylenes (Total) | 2 | 2 | 10,000 | <2 | 3.8 | <1 | | | | NA | <2 | <2 | <2 |
| SVOC 8270 | 10 | 11-50 | | <10.2-<11 | <50 | <11 | | | | NA | <26 | NA | <15 |
| PCBs | 0.2 | 2 | 0.5 | <2 | <2J | <2J | | | | NA | <2 | NA | NA |

☐ CT&E Data.
▩ F&B Data.
NA Not analyzed.
J Result is an estimate.
b DRPH and GRPH concentrations reported for these samples are equivalent to diesel and gasoline range organics (DRO and GRO) as defined by ADEC.

# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL
(DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Samples | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | | | | EB04 | |
| Laboratory Sample ID Numbers | | | | | 4427-4 | 4427-5 | | | | 4426-4 | 4427 4426 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L |
| Aluminum | 17.4 | 100 | | <100-350 (<100-340) | <100 (<100) | <100 (<100) | | | | <100 | <100 |
| Antimony | N/A | 100 | 6 | <100 (<100) | <100 (<100) | <100 (<100) | | | | <100 | <100 |
| Arsenic | 5.3 | 100 | 50 | <100 (<100) | <100 (<100) | <100 (<100) | | | | <100 | <100 |
| Barium | 1.2 | 50 | 2,000 | <50-93 (<51-91) | 290 (270) | 250 (240) | | | | <50 | <50 |
| Beryllium | N/A | 50 | 4 | <50 (<50) | <50 (<50) | <50 (<50) | | | | <50 | <50 |
| Cadmium | 1.7 | 50 | 5 | <50 (<50) | <50 (<50) | <50 (<50) | | | | <50 | <50 |
| Calcium | 34.5 | 200 | | 4,500-88,000 (4,100-86,000) | 480 (470) | 46,000 (45,000) | | | | <200 | <200 |
| Chromium | 3.29 | 50 | 100 | <50 (<50) | <50 (<50) | <50 (<50) | | | | <50 | <50 |
| Cobalt | N/A | 100 | | <100 (<100) | <100 (<100) | <100 (<100) | | | | <100 | <100 |
| Copper | 2.3 | 50 | 1,300 | <50 (<50) | <50 (<50) | <50 (<50) | | | | <50 | <50 |
| Iron | 25 | 100 | | 180-2,800 (100-1,600) | 1,400 (590) | 1,200 (640) | | | | 120 | <100 |
| Lead | 6.6 | 100 | 15 | <100 (<100) | <100 (<100) | <100 (<100) | | | | <100 | <100 |

☐ CT&E Data.
N/A Not available.

# TABLE 4-11. GARAGE ANALYTICAL DATA SUMMARY (CONTINUED)

Installation: Point Lonely
Site: Garage (SS09)

Matrix: Surface Water
Units: µg/L

METALS ANALYSES: TOTAL (DISSOLVED)

| Parameters | Detect. Limits | Quant. Limits | Action Levels | Bkgd. Range from 7 DEW Line Installations | Environmental Samples | | | | | Field Blank | Lab Blanks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | SW01 | SW02 | | | | EB04 | |
| Laboratory Sample ID Numbers | | | | | 4427-4 | 4427-5 | | | | 4426-4 | 4427<br>4426 |
| ANALYSES | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | | | | µg/L | µg/L |
| Magnesium | 47.8 | 200 | | <5,000-53,000)<br>(2,600-54,000) | 46,000<br>(46,000) | 44,000<br>(44,000) | | | | <200 | <200 |
| Manganese | 1.24 | 50 | | <50-510<br>(<50-120) | <50<br>(<50) | <50<br>(<50) | | | | <50 | <50 |
| Molybdenum | N/A | 50 | | <50<br>(<50) | <50<br>(<50) | <50<br>(<50) | | | | <50 | <50 |
| Nickel | 5.5 | 50 | 100 | <50<br>(<50) | <50<br>(<50) | <50<br>(<50) | | | | <50 | <50 |
| Potassium | 1,154 | 5,000 | | <5,000<br>(<5,000) | 11,000<br>(11,000) | 9,300<br>(9,600) | | | | <5,000 | <5,000 |
| Selenium | 62.4 | 100 | 50 | <100<br>(<100) | <100<br>(<100) | <100<br>(<100) | | | | <100 | <100 |
| Silver | 2.6 | 50 | 50 | <50<br>(<50) | <50J<br>(<50)J | <50<br>(<50) | | | | <50 | <50 |
| Sodium | 27.7 | 250 | | 8,400-410,000<br>(8,200-450,000) | 150,000J<br>(150,000)J | 140,000<br>(14,000) | | | | <250 | <250 |
| Thallium | .57 | 5 | 2 | <5<br>(<5) | <5<br>(<5) | <5<br>(<5) | | | | <5 | <5 |
| Vanadium | 1.8 | 50 | | <50<br>(<50) | <50<br>(<50) | <50<br>(<50) | | | | <50 | <50 |
| Zinc | 8.2 | 50 | | <50-160<br>(<50) | <50<br>(<50) | <50<br>(<50) | | | | <50 | 1,631<br>(<50-1,631) |

☐ CT&E Data.
N/A Not available.
J Result is an estimate.

## TABLE 4-12. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE GARAGE (SS09)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Garage (SS09) | Soil/Sediment | DRPH | 16,000J | mg/kg | <190-150J | -- | -- | 500[c] | Yes |
| | | GRPH | 400J | mg/kg | <20J-27J | -- | -- | 100[c] | Yes |
| | | RRPH | 10,000 | mg/kg | <180-<670 | -- | -- | 2,000[c] | Yes |
| | | Benzene | 0.28J | mg/kg | <0.04-<0.5 | 2.2 | -- | 0.5[c] | No |
| | | Toluene | 0.74 | mg/kg | <0.2-0.2 | -- | 5,400 | -- | No |
| | | Ethylbenzene | 6 | mg/kg | <0.2-0.5 | -- | 2,700 | -- | No |
| | | Xylenes (Total) | 30J | mg/kg | <0.4-2.267 | -- | 54,000 | -- | No |
| | | Tetrachloroethene | 18J | mg/kg | <0.04-<0.5 | 1.23 | 270 | -- | Yes |
| | | Trichloroethene | 0.5J | mg/kg | <0.04-<0.5 | -- | -- | -- | No |
| | | Naphthalene | 0.173 | mg/kg | <0.300-0.211 | -- | 100 | -- | No |
| | | Carbon Tetrachloride | 0.05J | mg/kg | <0.04-<0.5 | 0.492 | 18.9 | -- | No |
| | | 1,2,4-Trimethylbenzene | 0.098 | mg/kg | <0.300-0.956 | -- | -- | -- | No |
| | | 1,3,5-Trimethylbenzene | 0.227 | mg/kg | <0.300-0.409 | -- | -- | -- | No |
| | | Aluminum | 2,900 | mg/kg | 1,500-25,000 | -- | -- | -- | No |
| | | Barium | 86 | mg/kg | 27-390 | -- | 1,890 | -- | No |
| | | Calcium | 130,000 | mg/kg | 360-59,000 | -- | -- | -- | No |
| | | Copper | 12 | mg/kg | <2.7-45 | -- | 999 | -- | No |
| | | Iron | 15,000 | mg/kg | 5,400-35,000 | -- | -- | -- | No |
| | | Magnesium | 72,000 | mg/kg | 360-7,400 | -- | -- | -- | No |
| | | Manganese | 200 | mg/kg | 25-290 | -- | 3,780 | -- | No |
| | | Nickel | 7 | mg/kg | 4.2-46 | -- | 540 | -- | No |
| | | Potassium | 640 | mg/kg | <300-2,200 | -- | -- | -- | No |
| | | Sodium | 310 | mg/kg | <160-680 | -- | -- | -- | No |

## TABLE 4-12. IDENTIFICATION OF CHEMICALS OF CONCERN AT THE GARAGE (SS09) (CONTINUED)

| SITE | MATRIX | CHEMICAL DETECTED | MAXIMUM CONCENTRATION | UNITS | BACKGROUND RANGE | RBSL[a] | | ARAR[b] | CHEMICAL OF CONCERN |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CANCER | NON-CANCER | | |
| Garage (SS09) (Continued) | Soil or Sediment (Continued) | Vanadium | 26 | mg/kg | 6.3-59 | -- | 189 | -- | No |
| | | Zinc | 19 | mg/kg | 9.2-95 | -- | 8,100 | -- | No |
| | Surface Water | Benzene | 2J | μg/L | <1 | 0.617 | -- | 5[d] | **Yes** |
| | | Toluene | 6 | μg/L | <1 | -- | 96.5 | 1,000[e] | No |
| | | Xylenes (total) | 6J | μg/L | <2 | -- | 7,300 | 10,000[e] | No |
| | | Barium | 290 | μg/L | <50-93 | -- | 256 | 2,000[f] | **Yes** |
| | | Calcium | 46,000 | μg/L | 4,500-88,000 | -- | -- | -- | No |
| | | Iron | 1,400 | μg/L | 180-2,800 | -- | -- | -- | No |
| | | Magnesium | 46,000 | μg/L | <5,000-53,000 | -- | -- | -- | No |
| | | Potassium | 11,000 | μg/L | <5,000 | -- | -- | -- | No |
| | | Sodium | 150,000J | μg/L | 8,400-410,000 | -- | -- | -- | No |

a Risk-Based Screening Level.
b Applicable or Relevant and Appropriate Requirement.
c ADEC 1991.
d MCL, 52 FR 25690 (08 July 1987).
e MCL, 56 FR 3526 (30 January 1991).
f MCL, 56 FR 30266 (01 January 1991).
J Result is an estimate.
--- Not applicable.

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## 5.0 FEASIBILITY STUDY

The purpose of this section is to present the FS of remedial alternatives for the six sites at Point Lonely radar installation (Point Lonely) recommended for remedial action. These sites were identified based on the findings of the RI, reported in Sections 1.0 through 4.0 of this document, and the Point Lonely Risk Assessment (U.S. Air Force 1996). The Point Lonely sites recommended for remedial action and covered by this FS are:

- Sewage Disposal Area (SS01);
- Drum Storage Area (ST02);
- Beach Diesel Tanks (SS03);
- POL Storage (SS04);
- Diesel Spills (SS05); and
- Garage (SS09).

Complete RI results for these sites are presented in Section 4.0. This FS describes the evaluation of remedial alternatives used as the basis for the selection of the proposed remedial actions for the sites listed above.

Sites requiring no further action based on the RI and risk assessment are not included in this section. The proposed no further action sites are the Old Dump Site (LF07), Diesel Tanks (ST10), Inactive Landfill (LF11)/Vehicle Storage Area (SS14), Module Train (SS12), and Hangar Pad Area (SS13). RI results for these sites are presented in Section 3.0.

This FS complies with the NCP. It has been streamlined as described in the following section. The remainder of the introduction consists of a discussion of the streamlining approach, including risk management decisions, and an outline of the organization of the FS.

### 5.0.1 Approach To Feasibility Study

This FS is streamlined as follows to minimize unnecessary evaluation of remedial alternatives for the sites at Point Lonely.

- Remedial alternatives are developed for contaminated media (gravel, tundra, and soil beneath buildings) instead of individual sites. It is more logical, for instance, to remediate all of the gravel at the installation rather than conducting separate remedial actions at the four sites that have contaminated gravel.

- Remedial action characterization tables (presented in Section 5.1) recommended in the AFCEE Handbook (U.S. Air Force 1991) have been adapted to focus on the data essential to the evaluation of remedial alternatives. Wherever possible, reference is made to the RI and risk assessment for detailed site information, and assumptions used in calculating risk and identifying COCs to minimize repetition.

- General response actions (GRAs) and applicable technologies are screened together, and the alternatives are limited to no more than five conventional and innovative methods including the required no action alternative.

- Screening and detailed evaluation of remedial alternatives are not conducted for POL Storage (SS04) because a presumptive remedy will be employed.

  The contamination at POL Storage (SS04) is very limited spatially (see Figure 5-1) and apparently the result of a leak or spill from a nearby drum. Instead of evaluating remedial alternatives for this site, a presumptive action is recommended. The drums will be removed from the tundra and overpacked if in bad repair. The contents will be sampled to determine how the drums must be managed. Surface water sampling will be conducted at the site to determine if contaminants previously detected are still a concern. Based on sample results, the need for additional remedial action will be determined. A cost estimate for this work, including the cost for offsite disposal, is added to the estimate for remedial action for the other five sites. A cost estimate and estimate of project duration are included in Attachments A and B, respectively.

### 5.0.2 Risk Management Decisions

Two risk management decisions were made in writing the FS, based on a thorough review of the data.

- The remedial alternatives for the five sites other than POL Storage (SS04) do not address barium. Barium is listed as a COC in surface water associated with the Garage (SS09) because one water sample exceeds the noncancer RBSL and background concentration. Barium is not addressed because it is a naturally occurring element, is unrelated to any known activity at the installation, and was detected in only one sample.

- Water in tundra areas has been affected by contamination at the installation. Methods for remediating water directly are not promising because the surface water is extremely shallow, covers a wide area, remains frozen for over half the year, and is intimately associated with tundra. ADEC recognizes that physical remedial actions can be more harmful to tundra than petroleum contamination (see the Interim Guidance for Non-UST Contaminated Soil Cleanup Levels Guidance Number 001 - Revision Number 1, July 17, 1991, page 10). Instead of evaluating direct remedial alternatives for water in otherwise natural tundra areas, the approach has been taken that remediation of the source will improve the quality of surface water over time. COCs identified in surface water, therefore, are not considered in the preparation of this FS. The preferred remedial alternatives include a provision for sampling surface water to confirm the effectiveness of remedial actions.

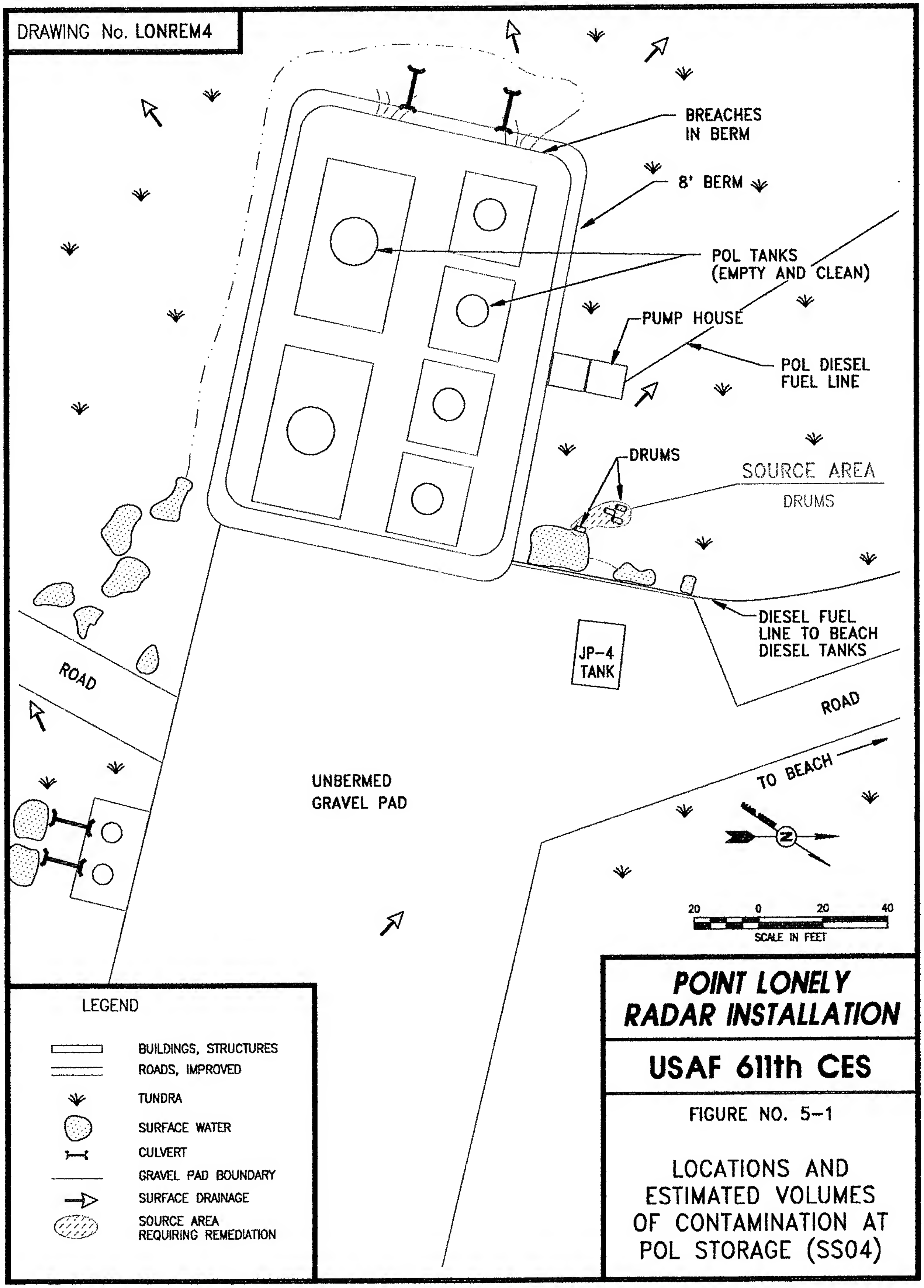


FIGURE NO. 5-1

LOCATIONS AND ESTIMATED VOLUMES OF CONTAMINATION AT POL STORAGE (SS04)

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As a result of these risk management decisions, the focus of the FS is on the cleanup of the sources of contamination at Point Lonely. The primary COC at the installation in site soil/sediments is DRPH. Other COCs include GRPH, RRPH, benzene, and tetrachloroethene.

### 5.0.3 Organization

The FS is organized as follows:

- Introduction;
- Site characterization for remediation (considers COCs, concentrations of chemicals detected, estimated areas and volumes of affected media, ARARs, and target cleanup levels or proposed remediation goals for each site);
- Screening of general response actions and presentation of representative remedial technologies;
- Development of remedial alternatives;
- Detailed evaluation of remedial alternatives (the detailed analysis is based on the AFCEE guidance and includes analyses of the nine NCP criteria). The detailed evaluation also includes a comparative analysis of alternatives, and identification of preferred alternatives);
- Siting study; and
- Detailed cost estimates and estimates of project duration in Attachments A and B, respectively.

## 5.1 SITE CHARACTERIZATION FOR REMEDIATION

Information relevant to the screening and evaluation of remedial alternatives for the six sites at Point Lonely is summarized in Tables 5-1 through 5-6. The tables include COCs, concentrations of chemicals detected, estimates of volumes of affected media, and the basis for listing each as a COC.

### 5.1.1 Summary of Site Information

The information considered for each medium includes:

- COCs;
- range of COCs detected;

## TABLE 5-1. REMEDIAL ACTION CHARACTERIZATION FOR THE SEWAGE DISPOSAL AREA (SS01)

| MEDIA | COCs | RANGE OF ENVIRONMENTAL CONTAMINATION | TARGET CLEANUP LEVEL[a] | BASIS FOR LISTING AS COC | VOLUME OF CONTAMINATED MEDIA | DESIGN PARAMETERS |
|---|---|---|---|---|---|---|
| Gravel | DRPH | ND - 16,000 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 3,333 cy | • microbial activity<br>• oxygen diffusion<br>• contaminant<br>• concentration<br>• solubility<br>• volume<br>• grain size<br>• seasonality<br>• volatility |
| | GRPH | ND - 1,000 mg/kg | 100 mg/kg | ADEC Non-UST Action Level | | |
| Tundra (soil/sediment) | DRPH | ND - 6,600 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 90 cy | |

a Target cleanup levels for DRPH and GRPH in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.

## TABLE 5-2. REMEDIAL ACTION CHARACTERIZATION FOR THE DRUM STORAGE AREA (ST02)

| MEDIA | COCs | RANGE OF ENVIRONMENTAL CONTAMINATION | TARGET CLEANUP LEVEL[a] | BASIS FOR LISTING AS COC | VOLUME OF CONTAMINATED MEDIA | DESIGN PARAMETERS |
|---|---|---|---|---|---|---|
| Gravel | DRPH | ND - 1,000 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 1 cy | • microbial activity<br>• oxygen diffusion<br>• contaminant<br>• concentration<br>• solubility<br>• volume<br>• grain size<br>• seasonality<br>• volatility |

a The target cleanup level for DRPH in soil is based on ADEC Non-UST guidance and does not necessarily correspond to the final site-specific cleanup goal.

## TABLE 5-3. REMEDIAL ACTION CHARACTERIZATION FOR THE BEACH DIESEL TANKS (SS03)

| MEDIA | COCs | RANGE OF ENVIRONMENTAL CONTAMINATION | TARGET CLEANUP LEVEL[a] | BASIS FOR LISTING AS COC | VOLUME OF CONTAMINATED MEDIA | DESIGN PARAMETERS |
|---|---|---|---|---|---|---|
| Gravel | DRPH | ND - 15,200 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 58 cy | • microbial activity<br>• oxygen diffusion<br>• contaminant<br>• concentration<br>• solubility<br>• volume<br>• grain size<br>• seasonality<br>• volatility |
| | GRPH | ND - 150 mg/kg | 100 mg/kg | ADEC Non-UST Action Level | | |

a The target cleanup level for DRPH and GRPH in soil are based on ADEC Non-UST guidance and do not necessarily correspond to the final site-specific cleanup goal.

## TABLE 5-4. REMEDIAL ACTION CHARACTERIZATION FOR THE POL STORAGE (SS04)

| MEDIA | COCs | RANGE OF ENVIRONMENTAL CONTAMINATION | TARGET CLEANUP LEVEL[a] | BASIS FOR LISTING AS COC | VOLUME OF CONTAMINATED MEDIA | DESIGN PARAMETERS |
|---|---|---|---|---|---|---|
| Tundra (soil/sediment) | Benzene | ND - 1.6 mg/kg | 0.5 mg/kg | ADEC Non-UST Action Level | <1 cy | • microbial activity<br>• oxygen diffusion<br>• contaminant<br>• concentration<br>• solubility<br>• volume<br>• grain size<br>• seasonality<br>• volatility |

a The target cleanup level for benzene in soil is based on ADEC Non-UST guidance and does not necessarily correspond to the final site-specific cleanup goal.

## TABLE 5-5. REMEDIAL ACTION CHARACTERIZATION FOR THE DIESEL SPILLS (SS05)

| MEDIA | COCs | RANGE OF ENVIRONMENTAL CONTAMINATION | TARGET CLEANUP LEVEL[a] | BASIS FOR LISTING AS COC | VOLUME OF CONTAMINATED MEDIA | DESIGN PARAMETERS |
|---|---|---|---|---|---|---|
| Gravel | DRPH | ND - 4,300 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 248 cy | • microbial activity<br>• oxygen diffusion<br>• contaminant<br>• concentration<br>• solubility<br>• volume<br>• grain size<br>• seasonality<br>• volatility |
| | GRPH | ND - 120 mg/kg | 100 mg/kg | ADEC Non-UST Action Level | | |
| Tundra (soil/sediment) | DRPH | ND - 1,300 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 30 cy | |
| | Benzene | ND - 1.2 mg/kg | 0.5 mg/kg | ADEC Non-UST Action Level | | |

a Target cleanup levels for DRPH, GRPH, and benzene in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.

## TABLE 5-6. REMEDIAL ACTION CHARACTERIZATION FOR THE GARAGE (SS09)

| MEDIA | COCs | RANGE OF ENVIRONMENTAL CONTAMINATION | TARGET CLEANUP LEVEL[a] | BASIS FOR LISTING AS COC | VOLUME OF CONTAMINATED MEDIA | DESIGN PARAMETERS |
|---|---|---|---|---|---|---|
| Soil beneath garage | DRPH | ND - 16,000 mg/kg | 500 mg/kg | ADEC Non-UST Action Level | 167 cy | • accessibility<br>• contaminant<br>• concentration<br>• solubility<br>• drainage<br>• microbial activity<br>• oxygen diffusion |
| | GRPH | ND - 400 mg/kg | 100 mg/kg | ADEC Non-UST Action Level | | |
| | RRPH | ND - 10,000 mg/kg | 2,000 mg/kg | ADEC Non-UST Action Level | | |
| | Tetrachloroethene | ND - 18 mg/kg | 12.3 mg/kg | Cancer risk of $10^{-6}$ | | |

a Target cleanup levels for DRPH, GRPH, and RRPH in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.

- target cleanup level (or proposed remediation goal - the lowest applicable action level based on the risk assessment including cancer risk, noncancer HQ, and chemical-specific ARARs);

- basis for the target cleanup level (specific ARAR, cancer risk or noncancer HQ); and

- design parameters for remedial action.

### 5.1.2 Estimated Areas, Volumes, and Masses of Contaminated Sites and Media

The approximate areas, volumes, and mass of the contaminated sites by medium are presented in Table 5-7. Areas and depths are estimated based on the RI, and the density of soil and gravel is estimated to be 1.8 tons/cubic yard. Actual areas, depths, and density of contamination may differ from the estimates, which will affect the cost of remediation. The locations and estimated volumes of contaminated media at each site are illustrated in Figures 5-2 through 5-6. The estimated total volume of each is:

- Gravel - 3,640 cubic yards;
- Tundra - 120 cubic yards; and
- Soil beneath the Garage (SS09) - 167 cubic yards.

General response actions and remedial alternatives are screened and evaluated for each media.

Estimates of cost and project duration are provided in Attachments A and B, respectively. These attachment are located at the end of Section 5.0. The POL Storage (SS04) will be remediated by a presumptive remedy described in Section 5.0.2.

**TABLE 5-7. APPROXIMATE AREAS, VOLUMES, AND MASSES OF CONTAMINATED MEDIA BY SITE AT POINT LONELY**

| SITE | MEDIUM | AREA (sq ft) | DEPTH (ft) | VOLUME (cy) | MASS (tons) |
|---|---|---|---|---|---|
| Sewage Disposal Area (SS01) | gravel | 30,000 | 3 | 3,333 | 6,000 |
| | tundra | 1,210 | 2 | 90 | 160 |
| Drum Storage Area (ST02) | gravel | 9 | 3 | 1 | 2 |
| Beach Diesel Tanks (SS03) | gravel | 525 | 3 | 58 | 105 |
| Diesel Spills (SS05) | gravel | 2,100 | 3 | 248 | 420 |
| | tundra | 400 | 2 | 30 | 53 |
| Garage (SS09) | Soil beneath garage | 4,500 | 1 | 167 | 300 |

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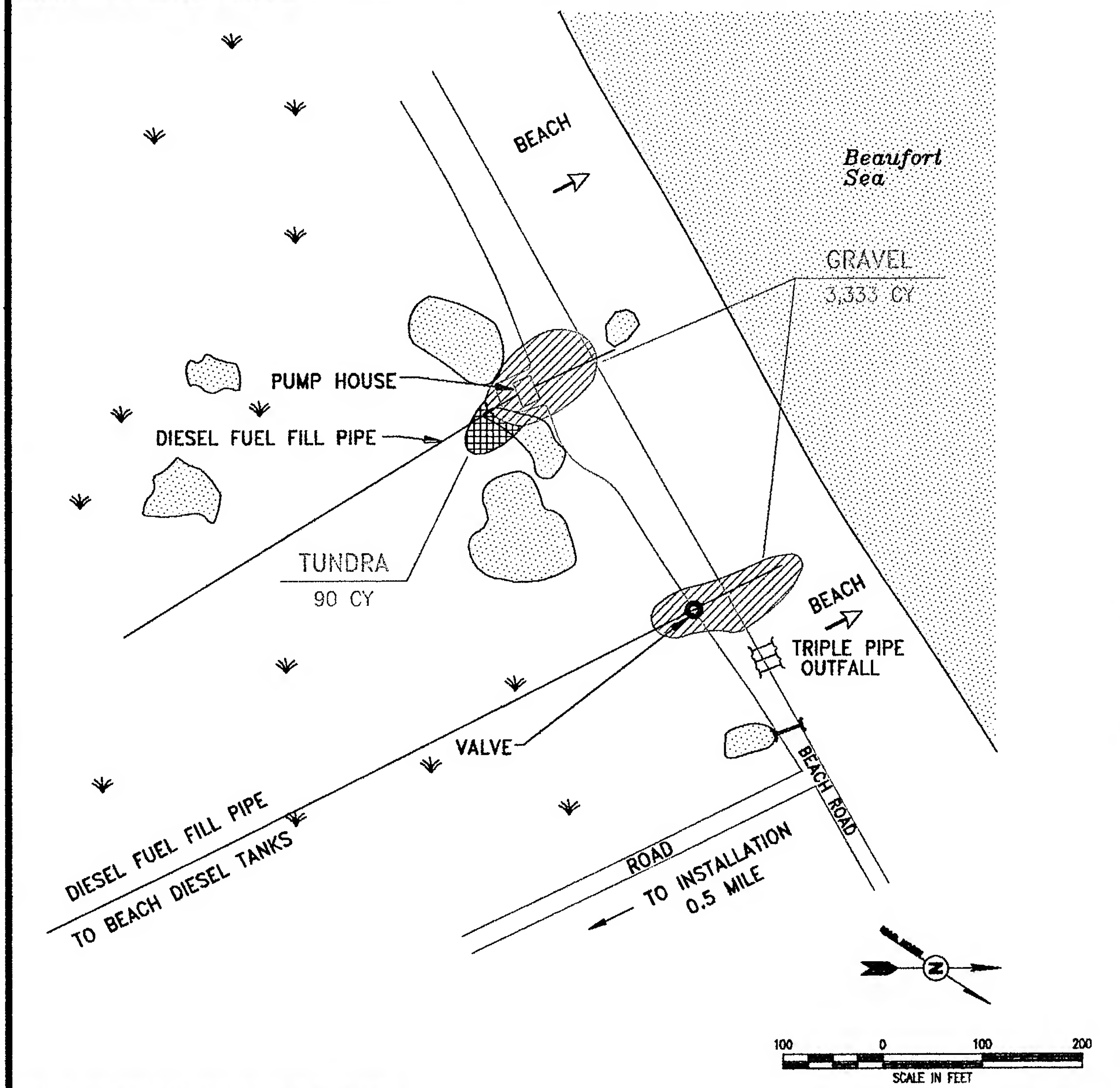
DRAWING No. LONREM1




LEGEND

- BUILDINGS, STRUCTURES
- ROADS
- TUNDRA
- SURFACE WATER
- SURFACE DRAINAGE
- CULVERT
- GRAVEL PAD BOUNDARY
- GRAVEL PAD AREA REQUIRING REMEDIATION
- TUNDRA AREA REQUIRING REMEDIATION

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 5-2

LOCATIONS AND ESTIMATED VOLUMES OF CONTAMINATION AT SEWAGE DISPOSAL AREA (SS01)

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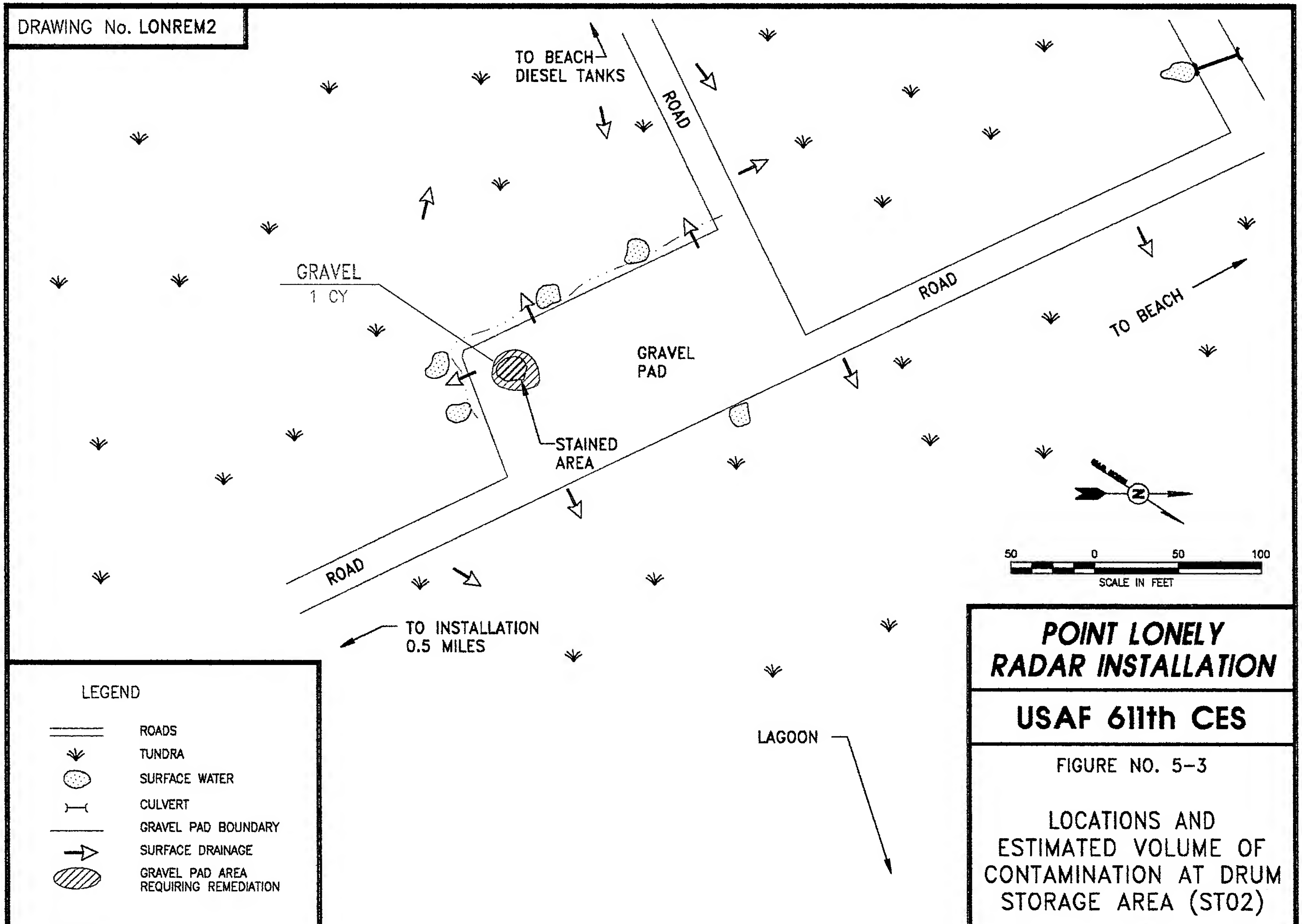
DRAWING No. LONREM2
TO BEACH
DIESEL TANKS
ROAD
ROAD
ROAD
GRAVEL
1 CY
GRAVEL
PAD
STAINED
AREA
TO BEACH
TO INSTALLATION
0.5 MILES
LAGOON
50
0
50
100
SCALE IN FEET
LEGEND
ROADS
TUNDRA
SURFACE WATER
CULVERT
GRAVEL PAD BOUNDARY
SURFACE DRAINAGE
GRAVEL PAD AREA
REQUIRING REMEDIATION
POINT LONELY
RADAR INSTALLATION
USAF 611th CES
FIGURE NO. 5-3
LOCATIONS AND
ESTIMATED VOLUME OF
CONTAMINATION AT DRUM
STORAGE AREA (ST02)

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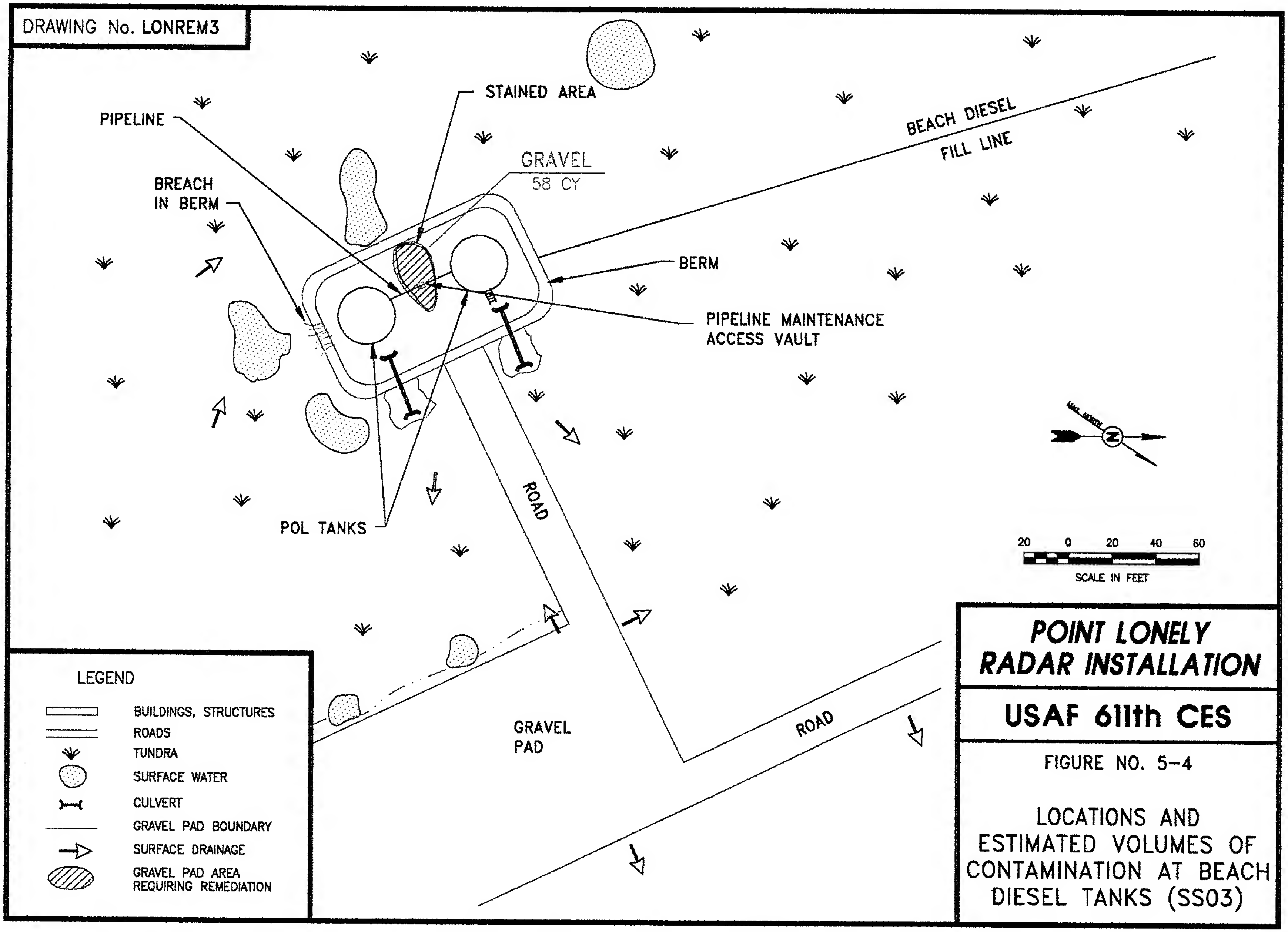


**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 5-4

LOCATIONS AND ESTIMATED VOLUMES OF CONTAMINATION AT BEACH DIESEL TANKS (SS03)

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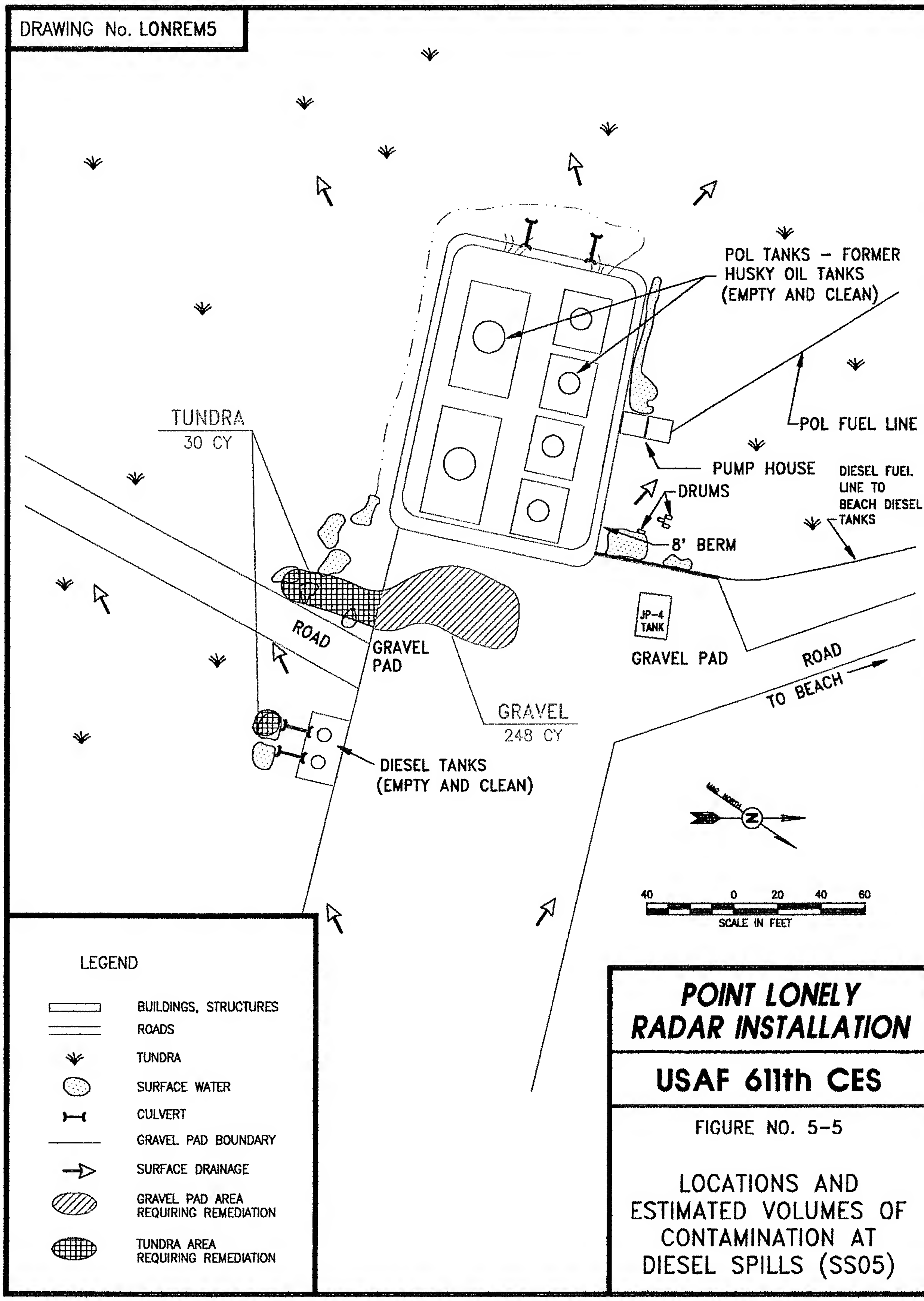


**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 5-5

LOCATIONS AND ESTIMATED VOLUMES OF CONTAMINATION AT DIESEL SPILLS (SS05)

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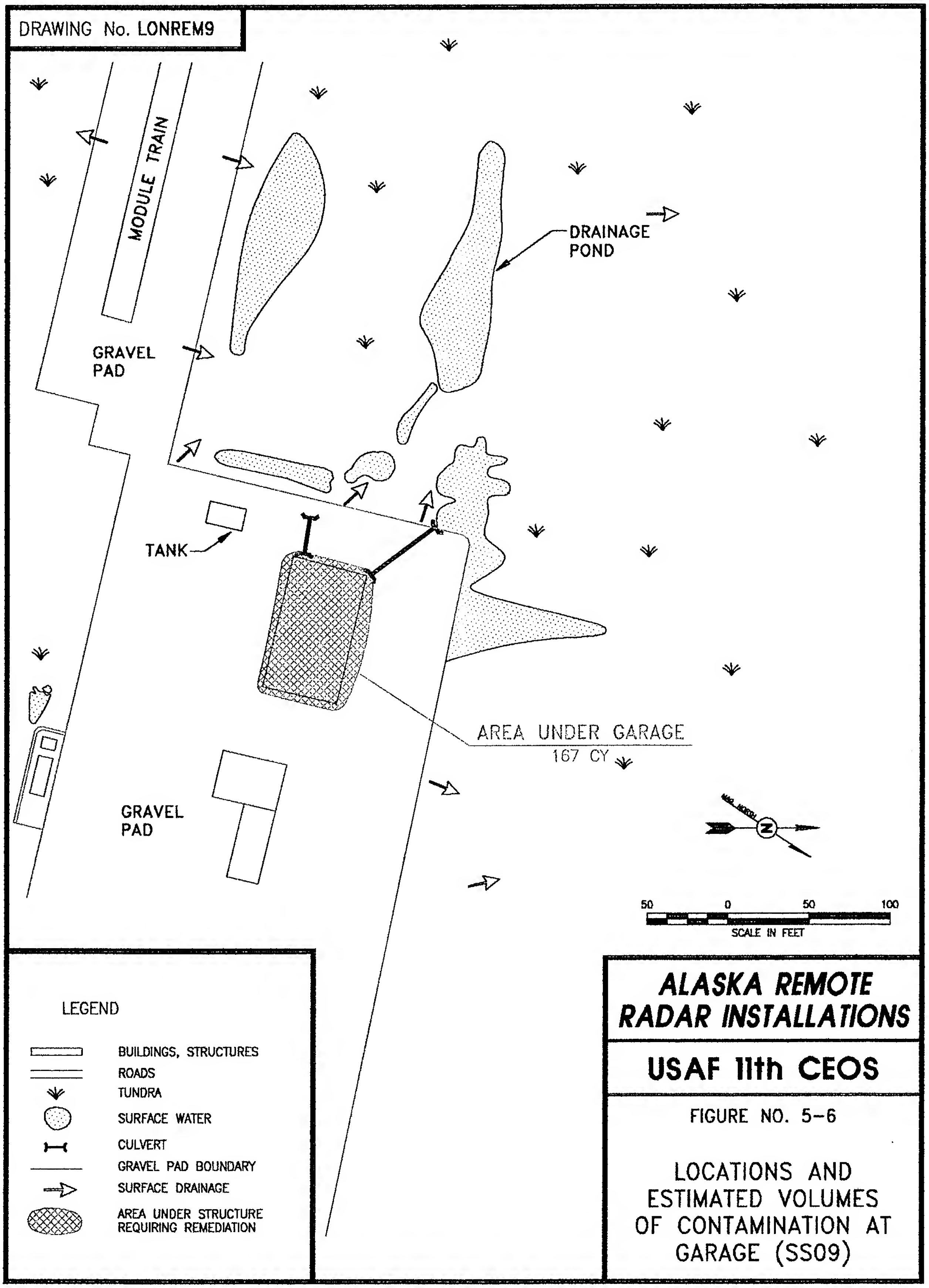


**ALASKA REMOTE RADAR INSTALLATIONS**

**USAF 11th CEOS**

FIGURE NO. 5-6

LOCATIONS AND ESTIMATED VOLUMES OF CONTAMINATION AT GARAGE (SS09)

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### 5.1.3 ARARs

According to the NCP, ARARs must be identified and evaluated to determine all of the requirements for remedial actions. There are three categories of ARARs:

- Chemical-specific;
- Action-specific; and
- Location-specific.

Chemical-specific ARARs are action levels that may apply in addition to risk or hazard-based remediation goals. Chemical-specific ARARs were identified during the RI and included in the Risk Assessment. The target cleanup levels or proposed remediation goals represent the lowest applicable action level.

Action-specific ARARs are requirements that relate to how remedial actions must be conducted. For example, offsite transportation of hazardous waste must be manifested in compliance with Department of Transportation (DOT) and RCRA requirements.

Location-specific ARARs impose requirements on a remedial action based on the location of the site. For example, there are specific requirements that pertain to wetlands. It should be noted that ADEC's Interim Guidance Non-UST contaminated soil target cleanup levels are intended as guidance and do not necessarily correspond to final site specific cleanup levels. The ARARs for the sites at the Point Lonely installation are presented in Table 5-8.

## 5.2 SCREENING OF GENERAL RESPONSE ACTIONS

### 5.2.1 Presentation and Screening of General Response Actions

GRAs are general approaches for remedial actions and can be active or passive measures. Active measures involve removal, active treatment, or isolation of the contaminated media. Passive measures rely on natural processes to reduce the toxicity, mobility or volume of contamination, or on controls put in place to limit exposure. Screening GRAs streamlines the FS process by establishing the feasibility of entire classes of remedial responses, thereby enabling the selection of a focused set of viable alternatives for detailed evaluation. GRAs have been evaluated for the three media contaminated at the Point Lonely installation: gravel, tundra, and the soil beneath the Garage (SS09).

The criteria for screening GRAs are implementability, duration, effectiveness, and cost. Implementability is estimated in terms of technical and administrative barriers. For example, containment is generally less acceptable to regulatory agencies than removal or treatment. Additionally, an innovative technology that has proven to be effective in the continental U.S. may not be implementable on the North Slope because it cannot be transported there.

Duration is the estimate of the time necessary to attain the treatment efficiency estimated from applicable case studies and the literature. The estimated duration of no action that includes

## TABLE 5-8. ARARs FOR SITES AT THE POINT LONELY INSTALLATION

| AUTHORITY | CITATION | TYPE OF ARAR | BASIS | CATEGORY OF ARAR |
|---|---|---|---|---|
| RCRA | 40 CFR Part 263 | Action-specific | Standards Applicable to Generators of Hazardous Waste | Relevant and Appropriate |
| RCRA | 40 CFR 268.35 | Action-specific | Land Disposal Restrictions | Relevant and Appropriate |
| Clean Air Act | 42 U.S.C. 7401-7642,<br>40 CFR 60, 61, and 63 | Action-specific | National Ambient Air Quality Standards (Treatment technology standards for fugitive emissions and landfills) | Applicable |
| RCRA | 55 FR 30798 | Chemical-specific | Standard for Solid Waste Management Units, SWMUs, in the RCRA Corrective Action Program | Relevant and Appropriate |
| SDWA | 52 FR 25690<br>56 FR 3526 | Chemical-specific | Maximum Contaminant Level for drinking water | Relevant and Appropriate |
| ADEC, Interim Guidance for Non-UST Action Levels | 18 AAC 75.140 | Chemical-specific | Standards for general guidance | Relevant and Appropriate |
| ADEC, Solid Waste Disposal Regulations | 18 AAC 60 | Action-specific | Standards applicable to land spreading | Applicable |

natural, unassisted biodegradation is long even though the time necessary to implement no action is short.

Effectiveness is the relative success of the response action in reducing contamination or risk to acceptable levels.

Cost is the total of estimated capital, operating, and administrative costs necessary to attain the projected treatment efficiency. This estimate is presented in relative terms (low, medium, and high).

The GRAs considered for the sites at Point Lonely are:

- No action;
- Institutional controls and monitoring;
- Containment;
- Onsite treatment; and
- Removal.

These GRAs are defined as follows.

**No Action**. Under no action, contaminants are left in place and only natural processes, such as biodegradation, would lower the concentrations of COCs. No action is considered for all three media.

**Institutional Controls and Monitoring**. Institutional controls and monitoring represent a passive response in which steps are taken to minimize the possibility of accidental exposure of humans and the environment to COCs. Institutional controls may include fencing off an area to minimize exposure and public education to show people how to avoid exposure. Institutional control of sites contaminated by petroleum hydrocarbons minimizes the chance of accidental exposure while natural, unassisted biodegradation occurs. Monitoring is included to determine if migration of contaminants is occurring and if natural processes are lowering the concentrations of the COCs.

**Containment**. Containment limits the potential for accidental exposure to contaminants by physical means. Examples include capping soils and using solidification techniques. Objectives can include one or more of the following: 1) minimize the risk of direct exposure to contaminated soils; 2) eliminate the possibility of contaminants or contaminated soils becoming airborne and migrating; and 3) prevent water from entering the contaminated area and transporting contaminants to other areas.

**Onsite Treatment**. Treatment may be used to reduce the toxicity, mobility, or volume of a contaminant and may be accomplished in situ or ex situ. In situ treatment involves active treatment with the medium in place. Ex situ treatment involves the removal of the contaminated medium, with subsequent treatment on the installation. The medium may be replaced in the original excavation after treatment. Treatment efficiencies vary depending on the technique used and the type of contaminant present.

**Removal**. Removal involves excavating the contaminated medium and shipping it offsite for treatment or disposal. Removal reduces the risk of exposure to the contaminant because it no longer remains at the installation.

Representative technologies for the GRAs retained are presented and screened in Section 5.2.2. The applicability of these GRAs at Point Lonely is determined using AFCEE screening criteria: implementability, project duration, effectiveness, and cost. GRAs considered for remediation of gravel, tundra, and the soil beneath the garage at the five sites slated for remediation at Point Lonely are presented in Tables 5-9 through 5-11. Screening was performed as follows:

**5.2.1.1 Screening of GRAs for Contaminated Gravel.** GRAs considered for remediation of gravel are presented in Table 5-9. No action, institutional controls and monitoring, and onsite treatment were retained for evaluation.

**5.2.1.2 Screening of GRAs for Contaminated Tundra.** GRAs considered for remediation of tundra are presented in Table 5-10. No action, institutional controls and monitoring, and onsite treatment were retained for evaluation.

**5.2.1.3 Screening of GRAs for Soil Beneath The Garage.** GRAs considered for remediation of soil beneath the Garage (SS09) are presented in Table 5-11. No action, containment, and onsite treatment were retained for evaluation.

### 5.2.2 Presentation of Technologies

This section describes remedial technologies considered for use at Point Lonely based on the retained GRAs. The selected technologies have all been effective in the Alaskan environment. The conditions present at Point Lonely, principally the arctic climate and remote location, exclude many technologies that could be considered for sites in a more temperate climate and accessible location.

The remedial technologies under consideration for the contaminated media at Point Lonely are presented in this section by GRA as follows:

<u>No Action</u>

- No action

<u>Institutional Controls and Monitoring</u>

- Institutional Controls and Monitoring (periodic monitoring, public education, and fencing)

<u>Containment [Garage (SS09)]</u>

- Containment by maintenance of freezing conditions (containment)

## TABLE 5-9. SCREENING OF GENERAL RESPONSE ACTIONS EVALUATED FOR GRAVEL

| GENERAL RESPONSE ACTION | REPRESENTATIVE TECHNOLOGIES | PROJECTED TREATMENT EFFICIENCY | RETAINED OR REJECTED | RATIONALE |
|---|---|---|---|---|
| No Action | • No Action | 50 percent | Retained | Implementability: Moderate<br>Duration: Short in the field, long to achieve bioremediation<br>Effectiveness: Low to Moderate<br>Cost: Low<br>Retained/Rejected: Retained (requirement of NCP). |
| Institutional Controls and Monitoring | • Institutional Controls and Monitoring (Monitoring, Public Education, Fencing) | 50 percent | Retained | Implementability: High<br>Duration: Moderate in the field, long to achieve biodegradation<br>Effectiveness: Low to Moderate<br>Cost: Low<br>Retained/Rejected: Retained due to high implementability and low cost. |
| Containment | • Solidification<br>• Capping | 80 percent reduction in mobility<br>0 percent reduction in mass | Rejected | Implementability: Low<br>Duration: Long<br>Effectiveness: Low<br>Cost: Moderate<br>Retained/Rejected: Rejected due to low implementability, low effectiveness, and long duration. |
| Onsite treatment | • Enhanced Bioremediation<br>• Land spreading<br>• Biosurfactants | 90 - 94 percent | Retained | Implementability: High<br>Duration: Short to Moderate<br>Effectiveness: Moderate to High<br>Cost: Moderate<br>Retained/Rejected: Retained due to high implementability, moderate to high effectiveness, and short to moderate duration. |
| Removal | • Excavation and offsite treatment | 100 percent | Rejected | Implementability: Moderate to High<br>Duration: Short<br>Effectiveness: High<br>Cost: High<br>Retained/Rejected: Rejected due to high cost. |

## TABLE 5-10. SCREENING OF GENERAL RESPONSE ACTIONS EVALUATED FOR TUNDRA

| GENERAL RESPONSE ACTION | REPRESENTATIVE TECHNOLOGIES | PROJECTED TREATMENT EFFICIENCY | RETAINED OR REJECTED | RATIONALE |
|---|---|---|---|---|
| No Action | • No Action | 50 percent | Retained | Implementability: Moderate<br>Duration: Short in the field, long to achieve natural bioremediation<br>Effectiveness: Low to Moderate<br>Cost: Low<br>Retained/Rejected: Retained (requirement of NCP). |
| Institutional Controls and Monitoring | • Institutional Control and Monitoring (Monitoring, Public Education, Fencing) | 50 percent | Retained | Implementability: High<br>Duration: Moderate in the field, long to achieve natural bioremediation<br>Effectiveness: Low to Moderate<br>Cost: Low<br>Retained/Rejected: Retained due to high implementability and low cost. |
| Containment | • Solidification<br>• Capping | 80 percent reduction in mobility<br>0 percent reduction in mass | Rejected | Implementability: Low<br>Duration: Long<br>Effectiveness: Low<br>Cost: Moderate<br>Retained/Rejected: Rejected due to low implementability, low effectiveness, and long duration. |
| Onsite treatment | • Enhanced Bioremediation | 94 percent | Retained | Implementability: High<br>Duration: Short to Moderate<br>Effectiveness: Moderate to High<br>Cost: Moderate<br>Retained/Rejected: Retained due to high implementability, moderate to high effectiveness, and short to moderate duration. |
| Removal | • Excavation and offsite treatment | 100 percent | Rejected | Implementability: Low<br>Duration: Short<br>Effectiveness: High<br>Cost: High<br>Retained/Rejected: Rejected due to high cost and low implementability. |

## TABLE 5-11. SCREENING OF GENERAL RESPONSE ACTIONS EVALUATED FOR SOIL BENEATH THE GARAGE (SS09)

| GENERAL RESPONSE ACTION | REPRESENTATIVE TECHNOLOGIES | PROJECTED TREATMENT EFFICIENCY | RETAINED OR REJECTED | RATIONALE |
|---|---|---|---|---|
| No Action | • No Action | 50 percent | Retained | Implementability: Moderate<br>Duration: Short in the field, long to achieve natural bioremediation<br>Effectiveness: Low to Moderate<br>Cost: Low<br>Retained/Rejected: Retained (requirement of NCP). |
| Institutional Controls and Monitoring | • Institutional Controls and Monitoring (Monitoring, Public Education, Fencing) | 50 percent | Retained | Implementability: High<br>Duration: Moderate in the field, long to achieve natural bioremediation<br>Effectiveness: Low to Moderate<br>Cost: Low<br>Retained/Rejected: Retained due to high implementability and low cost. |
| Containment | • Containment by Maintenance of Freezing Conditions | 90 percent reduction in mobility<br>0 percent reduction in mass | Retained | Implementability: Moderate<br>Duration: Long<br>Effectiveness: High<br>Cost: Low to Moderate<br>Retained/Rejected: Retained due to moderate implementability, high effectiveness, and low to moderate cost |
| Onsite treatment | • Enhanced Bioremediation<br>• Biosurfactants | 90 - 94 percent | Retained | Implementability: High<br>Duration: Short to Moderate<br>Effectiveness: Moderate to High<br>Cost: Moderate<br>Retained/Rejected: Retained due to high implementability, moderate to high effectiveness, and short to moderate duration. |
| Removal | • Offsite treatment/disposal | 100 percent | Rejected | Implementability: Low<br>Duration: Short<br>Effectiveness: High<br>Cost: High<br>Retained/Rejected: Rejected due to high cost and low implementability. |

Onsite Treatment

- Enhanced bioremediation
- Land spreading
- Biosurfactants

All of the technologies presented above have been applied effectively at sites on the North Slope or elsewhere in Alaska. In addition to being effective in cold climates, they are well-suited to the short summer season (the only favorable time for outdoor remedial activities) and the remote location where there is little or no staffing for year-round operation and maintenance of remedial systems. Specifically, these remedial technologies are either short-term actions that can be completed in one season (approximately 100 days) with imported labor, or longer term actions that are self-sustaining and require minimal labor.

Several of the retained remedial technologies involve bioremediation, which can be accomplished on the North Slope with psychrophilic (i.e., cold weather) microorganisms both indigenous and imported. Bioremediation has been documented on the North Slope and elsewhere in Alaska, but is subject to several limiting factors including:

- availability of nutrients and oxygen;
- short periods of thaw; and
- percentage of fine-grained materials.

Biodegradation generally can be estimated in terms of first order kinetics where the only rate limiting factor is the biodegradation potential. Biodegradation potential is a function of the factors listed above. With first order kinetics, a given target cleanup level will eventually be reached regardless of the initial concentration. As the gap between initial and target concentrations widens or rate limiting factors become more significant, however, the time necessary to reach the target increases exponentially because the function plots asymptotically with concentration. A more detailed discussion of the estimates of biodegradation is presented in Section 5.4.

Descriptions of the technologies that have been retained are presented in the following subsections.

**5.2.2.1 No Action.** No action is a required alternative of the NCP, the purpose of which is to provide a baseline for assessment of other alternatives.

**5.2.2.2 Institutional Controls and Monitoring.** This technology involves no active treatment, but takes advantage of natural, unassisted biodegradation that occurs in the arctic soil (Atlas 1985). Natural, unassisted bioremediation typically takes longer than assisted bioremediation. The rate of biodegradation, especially in the North Slope region, is reduced because of short warm seasons and prolonged harsh winters. Public education and fencing off the affected area would constitute institutional controls, and periodic monitoring would include sampling and analysis of any associated surface water and soil/sediment.

Institutional controls and monitoring are being evaluated for the petroleum-related contaminants in gravel, tundra, and soil beneath the Garage (SS09) at Point Lonely. The case studies used to support biodegradation-based alternatives are used to estimate potential rates of natural, unassisted bioremediation.

**5.2.2.3 Containment by Maintenance of Freezing Conditions (Containment).** The contaminated soil beneath the Garage (SS09) represents a difficult remedial problem because the Air Force does not intend to raze the structure at this time. The vertical access may be insufficient to manually remove the contaminated soil or to use equipment to do so. Attempts to flush the contamination introduce issues related to the control of runoff. One solution is to maintain freezing conditions under the garage year round to keep contaminants locked in ice or frozen ground. The underside of the garage is relatively cold year round because it remains shaded during the summer. This form of containment includes insulation, gravel cover and heat exchangers. Once the building is dismantled, the contaminated soil can be excavated and managed appropriately.

**5.2.2.4 Enhanced Bioremediation.** Enhanced bioremediation in this FS involves delivering water and nutrients to the contaminated soils in place to assist natural bioremediation. Several organisms that can utilize the carbon in petroleum are indigenous to the North Slope, including: *Bacillus cereus, Bacillus polymixa, Arthrobacter globiformis*, and *Alcaligenes poradoxus* (Ratliff 1993). In addition, several strains of *Pseudomonas* bacteria (psychrophilic genera) decreased TPH concentration in tundra during the summer season in the Prudhoe Bay area (Jorgenson et al. 1992). A case study conducted at Point Thompson, Alaska suggests that this approach is feasible for remediation of gravel pads if a cultured population of microbes is used (Liddell 1991). The cultured population could be either indigenous or exotic. A treatability study will be necessary to determine how best to bioremediate each of the three media.

Variations in temperature affect the rate of biodegradation by bacteria. In the arctic environment, bacteria remain active enough to consume petroleum hydrocarbon molecules from June through August when temperatures are warmest. Successful biodegradation of petroleum hydrocarbon contaminants in soil by indigenous bacteria is possible at the ambient arctic summer temperatures. A study at Surfcote Pad in the Prudhoe Bay area (Evans, Elder, and Hoffman 1992) indicates that native microbial populations were capable of bioremediating diesel contaminated gravel at an appreciable rate during the short summer season. In the arctic environment at a depth of three feet microbial populations can effectively consume hydrocarbon products (Atlas 1985). The number and activity of bacteria decrease with depth, however, because of reduced levels of oxygen and nutrients.

Enhanced bioremediation is being evaluated for gravel, the soil underneath the garage, and tundra. Water with microbes and nutrients may be added intermittently based on the results of a treatability study. The water applied to ares beneath the Garage (SS09) would be warmed. In the tundra and gravel, water does not need to be warmed because heat is provided by the sun.

It is anticipated that this process would not generate runoff, nonetheless, precautions will be taken to contain any runoff that occurs. Any runoff would be analyzed for COCs. In addition,

because of the proximity of surface water bodies, absorbent materials may be added to the treatment perimeter for containment. Figure 5-7 is a process flow diagram of enhanced bioremediation.

**5.2.2.5 Biosurfactants.** Biosurfactants have been used to remove hydrocarbons from contaminated soils and gravels. Biosurfactants are products of bacterial fermentation and may include sugars, fats, and proteins. They act by attaching to, and surrounding, hydrocarbon molecules thus detaching them from soil particles. Biosurfactants do not alter the structure of the hydrocarbons, but render them temporarily inert, preventing them from reattaching to soil particles and allowing their removal from soils by flushing with water. The flush water mixture is then collected and the biosurfactant-hydrocarbon mixture, which floats on water, is removed by skimming. The collected mixture can be containerized for offsite treatment/disposal or bioremediated onsite in an aerated tank.

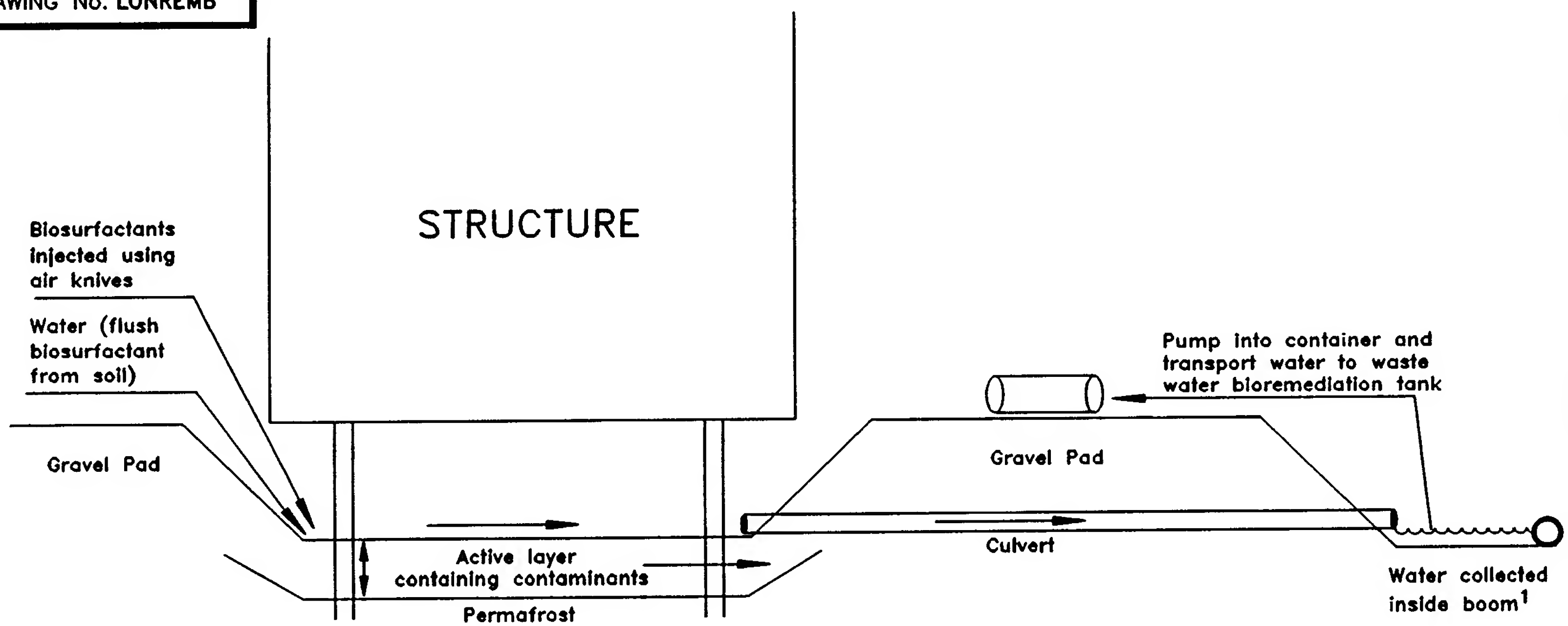
This technology is being evaluated for treating DRPH, GRPH, RRPH, and tetrachloroethene at the Garage (SS09) site. It is readily available in Alaska and involves using high intensity "air knives" to jet the biosurfactant into the material being remediated. It is anticipated from the results of the site investigations that contamination beneath the structures is shallow (<1 foot) because permafrost close to the surface prevents the hydrocarbons from infiltrating deeply.

After the biosurfactant is applied, the medium will be flushed with water to remove the mix of hydrocarbons and surfactant. The flush water mixture will be collected from drainage pathways exiting areas beneath the Garage (SS09). Performance may not match case histories involving fairly fresh crude oil on rock surfaces, but it is anticipated that the mobile fraction of the weathered petroleum will be dislodged sufficiently for successful remediation. The technique will be tested if necessary at the Garage (SS09) at the spot where 16,000 mg/kg of DRPH was detected, or at a similar DEW Line garage. Figure 5-8 is a diagram of the process.

**5.2.2.6 Land Spreading.** The objective of land spreading is to increase the surface area to volume ratio of soils contaminated with petroleum hydrocarbons to allow the low molecular weight fraction to volatilize more quickly, and to enhance biodegradation by exposing more of the soil to air. Target COCs are DRPH, GRPH, and benzene.

Land spreading is being evaluated for the gravel at the Sewage Disposal Area (SS01), the Drum Storage Area (ST02), Beach Diesel Tanks (SS03), and Diesel Spills (SS05). The process is straightforward. A backhoe or other earth-moving equipment is used to excavate the contaminated gravel and spread it in two-inch layers on clean gravel. It is important to note that the gravel will not be spread on tundra. Moisture will be added during spreading to promote biodegradation. ADEC regulates this activity under a solid waste disposal permit if the petroleum hydrocarbon contamination exceeds 1,000 mg/kg. The need for a solid waste disposal permit will need to be evaluated on a site-by-site basis. Approximately 13.5 acres of clean gravel surface will be necessary to land spread the contaminated gravel.

DRAWING No. LONREMB




NOTES

This process should begin before general site remediation so that water treated from this process can be used as process water for either soil washing or ex-situ bioremediation.

1. Booms and other collection materials will be tested and disposed of offsite.

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 5-7

BIOSURFACTANTS PROCESS FLOW DIAGRAM

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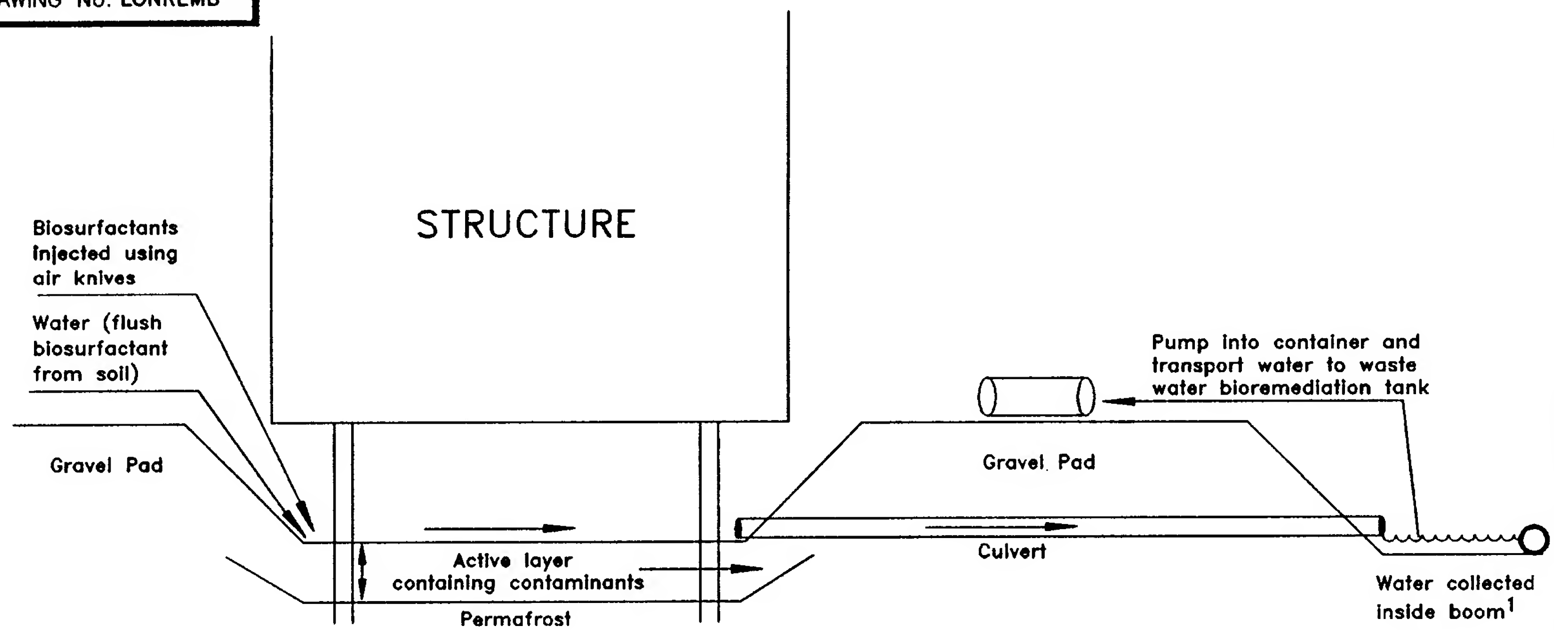


NOTES

This process should begin before general site remediation so that water treated from this process can be used as process water for either soil washing or ex-situ bioremediation.

1. Booms and other collection materials will be tested and disposed of offsite.

**POINT LONELY RADAR INSTALLATION**

**USAF 611th CES**

FIGURE NO. 5-8

APPLICATION OF BIOSURFACTANTS PROCESS FLOW DIAGRAM

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$$\left[(3{,}640\ yd^3 \times 27ft^3/yd^3 \times (\frac{12\ in/ft}{2\ in}) \div 43{,}560\ ft^2/acre\right] = 13.5\ acres$$

There is not enough area of available clean gravel at the installation to land spread the estimated volume of contaminated gravel at one time. Land spreading would therefore have to be staged over several years or permission to employ thicker lifts would have to be obtained.

## 5.3 DEVELOPMENT OF REMEDIAL ALTERNATIVES

### 5.3.1 Approach to Developing Remedial Alternatives

The remedial technologies selected in Section 5.2.2 represent the GRAs retained in Section 5.2.1. In this section the remedial technologies are developed into alternatives designed to address site-specific COCs. Because the alternatives are designed around the media (e.g., gravel, tundra), remedial technology is sufficient to define an alternative that can be applied to different sites. Alternatives developed in this section are evaluated in the detailed evaluation of remedial alternatives, Section 5.4.

This section is organized by remedial alternative. The rationale for development and a list of applicable sites and media are included. Remedial alternatives are summarized in Table 5-12 at the end of the section.

The remedial alternatives retained for contaminated gravel, tundra, and soil beneath the garage at the Point Lonely radar installation are:

- No action;
- Institutional controls and monitoring;
- Containment;
- Enhanced bioremediation;
- Biosurfactants; and
- Land spreading.

#### 5.3.1.1 No Action.

**Rationale for Development.** No action provides a baseline against which other alternatives are compared, and it is a required alternative according to the NCP. Attenuation of petroleum hydrocarbons may occur over a long period of time through biodegradation if microbial populations and conditions (e.g., water, oxygen, temperature, and nutrients) are present that facilitate aerobic biodegradation.

**Applicable Media and Sites.**

- Gravel: Sewage Disposal Area (SS01); Drum Storage Area (ST02); Beach Diesel Tanks (SS03); and Diesel Spills (SS05).

- Tundra: Sewage Disposal Area (SS01); and Diesel Spills (SS05).

- Soil beneath the Garage (SS09).

#### 5.3.1.2 Institutional Controls and Monitoring.

**Rationale for Development.** This alternative is applicable to all of the media because the COCs do not pose a significant cancer risk or noncancer hazard except for one sample of tetrachloroethene at the Garage (SS09). Natural attenuation of petroleum hydrocarbons may occur over a long period of time if microbial populations and aerobic conditions (e.g., water, oxygen, temperature, and nutrients) are present that facilitate aerobic biodegradation.

Institutional controls considered include public education and fencing off the affected area. Monitoring would be conducted periodically to ensure that contaminants are biodegrading and are not migrating offsite. Monitoring data would be combined with the predicted degradation rate presented in this section to demonstrate the effectiveness of natural, unassisted biodegradation and the continued immobility of tetrachloroethene beneath the Garage (SS09).

**Applicable Media and Sites.**

- Gravel: Sewage Disposal Area (SS01); Drum Storage Area (ST02); Beach Diesel Tanks (SS03); and Diesel Spills (SS05).

- Tundra: Sewage Disposal Area (SS01); and Diesel Spills (SS05).

- Soil beneath the Garage (SS09).

#### 5.3.1.3 Containment.

**Rationale for Development.** The soil beneath the Garage (SS09) poses several technical problems because the Air Force has no immediate plans to dismantle the buildings. Vertical access is limited, therefore conventional excavation is infeasible. Containment by maintenance of freezing conditions could be an effective way to prevent the migration of contaminants until the building is dismantled or a highly effective remedial technology becomes available. Human exposure would be very limited because of the low vertical clearance. Several methods exist for maintaining freezing conditions beneath buildings in Alaska. Methods include insulation, heat exchangers, or a combination of the two.

**Applicable Media and Sites.**

- Soil beneath the Garage (SS09)

#### 5.3.1.4 Enhanced Bioremediation.

**Rationale for Development.** This is an effective, low maintenance method for reducing petroleum concentrations in tundra that is also applicable to gravel and the soil beneath the

Garage (SS09). Enhanced bioremediation is accomplished by adding and maintaining nutrients, moisture, and oxygen to the contaminated medium in proportions established through treatability testing that promote the degradation of petroleum hydrocarbons by indigenous microorganisms. This alternative is more aggressive than natural, unassisted attenuation, yet can be designed to limit disturbance of the tundra and permafrost. A treatability study will be necessary to demonstrate site-specific viability of this alternative. For example, the percentage of fine-grained soils in the gravel will affect its ability to retain moisture and organic carbon; and the presence of tetrachloroethene may interfere with biodegradation of the petroleum hydrocarbons beneath the Garage (SS09).

Periodic monitoring will verify the progress of the bioremediation.

**Applicable Media and Sites.**

- Gravel: Sewage Disposal Area (SS01); Drum Storage Area (ST02); Beach Diesel Tanks (SS03); and Diesel Spills (SS05).
- Tundra: Sewage Disposal Area (SS01); and Diesel Spills (SS05).
- Soil beneath the Garage (SS09).

#### 5.3.1.5 Biosurfactants.

**Rationale for Development.** Biosurfactants were proven effective in removing petroleum hydrocarbons from shallow soils, hard surfaces, and rocks following the Valdez oil spill. It is applicable to the contaminated soil beneath the Garage (SS09). Biosurfactants are not recommended for the gravel or tundra. This remedial alternative provides a more aggressive solution for the contamination beneath the Garage (SS09).

Rinse water will be recirculated during the removal process to minimize the volume of wastewater. The rinse water will be monitored in the tank or drums a year after the remedial action to ensure that the petroleum hydrocarbons have biodegraded.

**Applicable Medium and Sites.**

- Soil beneath the Garage (SS09).

#### 5.3.1.6 Land Spreading.

**Rationale for Development.** Land spreading is a recognized method for remediating petroleum hydrocarbons in gravel in Alaska. There are established regulations for the approach. There may not be ample areas of clean gravel on which to spread the estimated volume of contaminated gravel in two-inch lifts sufficiently far away from surface water. In order to employ land spreading at Point Lonely, either the project would have to be staged over several years or thicker lifts would have to be negotiated (i.e., six inches). Land spreading is not appropriate for either the tundra or the soil beneath the Garage (SS09).

Periodic monitoring will establish the effectiveness of this alternative.

**Applicable Media and Sites.**

- Gravel: Sewage Disposal Area (SS01); Drum Storage Area (ST02); Beach Diesel Tanks (SS03); and Diesel Spills (SS05).

## 5.4 DETAILED EVALUATION OF REMEDIAL ALTERNATIVES

### 5.4.1 Approach

The alternatives developed in Section 5.3 are evaluated in this section using the suggested criteria in the AFCEE guidance for remedial alternative evaluation. These five criteria are defined in Sections 5.4.1.1 through 5.4.1.5. The detailed evaluation of alternatives is conducted in Section 5.4.2 and summarized in Section 5.4.3. The alternatives are evaluated with respect to the NCP's nine criteria in Section 5.4.4. Preferred alternatives are presented in Section 5.4.5.

**5.4.1.1 Successful Application Of The Technology Under Site Conditions.** This criterion requires the location and approximate date of the applications, the managing entity, and a description of successful applications of the given alternative under conditions similar to those found at the Point Lonely installation. Case studies conducted on the Alaskan North Slope are used to the extent possible.

**5.4.1.2 Total Project Cost.** The total cost of performing the remedial alternative is estimated and divided into technology testing, capital, total labor, operating, environmental testing, and closure costs.

For the purpose of this evaluation, the itemized cost elements are defined as follows:

- Technology testing costs consist of pilot tests or treatability studies;
- Capital costs include equipment or materials purchased;
- Total labor costs include the labor required for operating and maintaining the remedial action system, oversight, project management, design and development of planning documents;
- Operating costs include costs other than labor associated with operating remedial systems (e.g., nutrients);
- Environmental testing costs are for sampling and analysis, including periodic monitoring, and monitoring associated with site closure; and
- Closure costs related to reporting associated with site closure.

**5.4.1.3 Contaminant Reduction**. The reduction in concentration of each COC may be projected for each medium and site based on case-study-derived efficiencies. This reduction, referred to as post-remedial concentration, is listed with the initial concentration and target cleanup level. Post-remedial concentration is a more useful measure of effectiveness than risk reduction for the remedial alternatives at the Point Lonely installation. None of the COCs, except for tetrachloroethene beneath the Garage (SS09), present significant cancer risk or noncancer hazard. Risks or hazards, therefore, are not the indicators of successful remediation. Post-remedial concentration is applicable to target cleanup concentrations set by regulations and/or cleanup guidance.

The concentrations presented in this section are defined as follows:

**Initial Concentration**. This is the maximum initial concentration of the COC detected. The average concentrations of sample results that exceed target cleanup levels are included in parentheses.

**Target Cleanup Level**. This is the cleanup level specified for the given COC (the basis for which is presented in Tables 5-1 to 5-6).

**Post Remedial Concentration**. This is the estimated final concentration of the COC based on remedial efficiencies from case studies. References to these case studies can be found in Section 5.4.2.1, successful applications of alternatives. The estimated remedial efficiencies presented apply to all organic COCs for biosurfactants. For enhanced bioremediation, land spreading, institutional controls and monitoring, and no action, the estimated remedial efficiencies apply to petroleum hydrocarbons. An efficiency for tetrachloroethene (PCE) remediation associated with biological alternatives is not included because tetrachloroethene does not readily biodegrade under aerobic conditions. PCE is represented by only a single sample at one site at a concentration within 6 mg/kg of the target cleanup level. The biological and limited action alternatives assume tetrachloroethene will remain in place. The estimated efficiencies are all independent of time (over the short term, e.g., one year, biodegradation would be significantly less efficient than active remedial alternatives like biosurfactants).

The following efficiency is used for petroleum hydrocarbons, benzene, and tetrachloroethene:

- Biosurfactants - 90 percent (case studies indicate a higher efficiency, but the unique application may result in a loss of efficiency).

The following efficiencies are used for DRPH, GRPH, RRPH, and benzene:

- Enhanced bioremediation - 94 percent;
- Land spreading - 75 percent; and
- Institutional controls and monitoring; and no action - 50 percent (Naturally occurring bioremediation).

The post-remedial concentration is estimated using the following formula (assuming no time constraints):

Post-Remedial Concentration = Initial Concentration x (1 - Remedial Efficiency)

**5.4.1.4 Project Duration.** The estimated duration of each remedial alternative and associated project schedule is an important consideration because of the seasonal limitations on outdoor work and the lack of personnel to perform operation and maintenance activities in this remote location. The North Slope of Alaska is frozen and covered with snow and ice for the majority of the year, leaving a period of only approximately 100 days in the summer when the weather is favorable for outdoor work. Outdoor phases of remedial actions significantly longer than 100 days must be suspended until the following summer, causing a marked increase in duration because of the extended winter down time. In order to maximize efficiency, remedial alternatives were designed either to complete outdoor phases of remediation within this narrow time frame or extend over a longer term and require only minimal labor.

Project durations are based on case studies from Alaska. The rates of biological degradation for enhanced bioremediation, land spreading, and naturally occurring bioremediation associated with no action and institutional controls and monitoring are expressed as a first order decay function. The first-order decay function used to model this biological degradation is $C = C_o e^{-kt}$ (C is final concentration, $C_o$ is the initial concentration, e is the natural logarithm, k is a constant based on case studies, and t is time).

The rate constant, k, is estimated based on related case studies. In general, the k-values presented reflect the lower end of the expected range of values. These values are then downwardly adjusted because of the arctic environment conditions. The lowest rates are associated with no action and institutional controls and monitoring because there is no enhancement of conditions. The next lowest rate is associated with land spreading because adding moisture and oxygen are but two of several factors that can be optimized, and the climate factor is unaffected. Enhanced bioremediation ranks highest because more factors are optimized. DRPH is used to estimate the constants for all of the petroleum hydrocarbons because it represents by far the highest concentrations at all of the sites. The concentration of DRPH, therefore, is the controlling factor in determining the effectiveness of the remedial alternatives for these sites. The following constants and criteria were used for estimation of remedial rates:

<u>DRPH Reduction</u>

No Action and institutional controls and monitoring (Natural, unassisted bioremediation) — k = 0.0025/day

The k-value for no action and institutional controls and monitoring is based on rate data from a control cell in an experiment to measure the effectiveness of enhanced bioremediation (Liddell et al. 1991). The case study k-value was decreased in an attempt to offset the bias that aeration of the control cell introduces.

Land spreading — k = 0.005/day

The decay constant for land spreading is estimated to fall between a case study (Song et al. 1990) involving lime and nutrient addition and the control cell data cited above for natural, unassisted biodegradation.

| | |
|---|---|
| Enhanced bioremediation | k = 0.008/day |

This rate is based on the rates found from observing a number of case studies. It represents a downward adjustment of the low end of the range of decay constants observed because many of the case studies took place under climatic conditions more favorable than those which exist at Point Lonely.

A comparison of the predicted degradation of DRPH using the four bioremedial alternatives being evaluated is illustrated in Figure 5-9. (No action and institutional controls and monitoring are both represented by natural unassisted bioremediation.)

The duration of onsite remedial activity and the total project duration are presented in Attachment B. These durations are defined as follows:

- Duration of onsite remedial activity includes all onsite activities related to conducting the remedial action: sampling, operating remedial equipment, mobilization, and demobilization (this is a quantification of the relative duration estimate). The duration for alternatives involving bioremediation (except for biosurfactants) are limited to three years. Over three years, based on the estimated rate of biodegradation of DRPH and periodic monitoring, the COCs will probably have reached the target cleanup levels. If not, they will have likely diminished sufficiently in concentrations to demonstrate a trend in that direction that would support a decision to close the site.

- Total project duration includes the duration of onsite remedial activity, as well as time required for preparing planning documents, conducting permitting activities, and closure.

**5.4.1.5 Data Gaps.** Data gaps include any environmental testing or treatability studies that must be done to determine the effectiveness of a given remedial alternative under site conditions.

Alternatives are analyzed comparatively in Sections 5.4.3 and 5.4.4 based on the AFCEE criteria above, and the nine criteria in the NCP, respectively. The preferred remedial alternatives are identified in Section 5.4.5.

### 5.4.2 Detailed Evaluation of Alternatives

This section presents a detailed evaluation of remedial alternatives for the five sites requiring remedial action at the Point Lonely radar installation: the Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), Diesel Spills (SS05), and the Garage (SS09). Alternatives are developed by medium, i.e., gravel, tundra, and soil beneath the garage, rather

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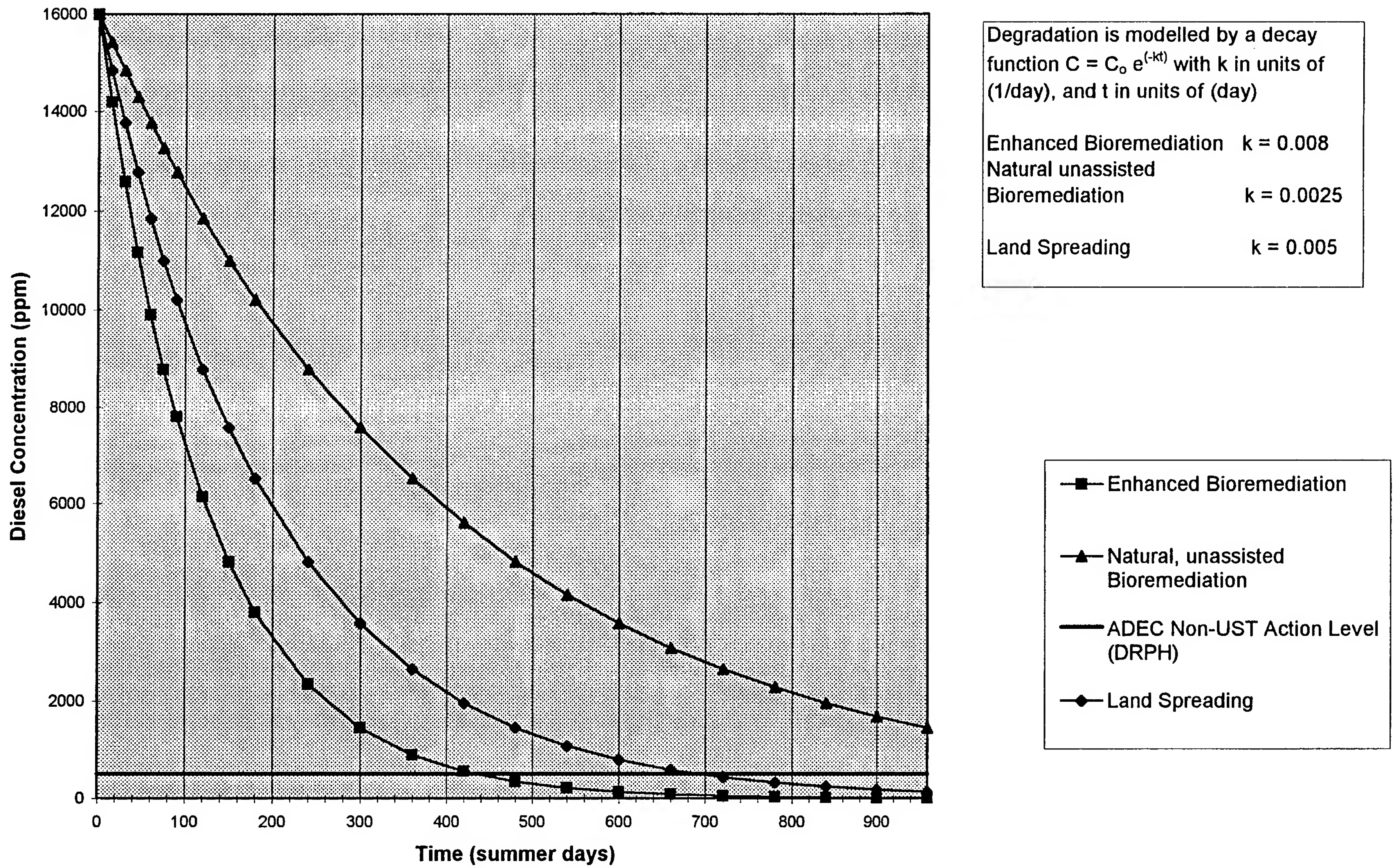
**Figure 5-9. Comparative Biodegradation of Diesel Fuel in the Environment (Basis: Maximum Diesel Concentration of 16,000 ppm at Point Lonely)**



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than by site. Table 5-12 summarizes the remedial alternatives evaluated in Sections 5.4.2.1. through 5.4.2.5.

#### 5.4.2.1 Successful Applications of Alternatives.

For brevity, alternatives that apply to more than one medium are described only once.

**No Action**. As part of a study on bioremediation of DRPH-contaminated gravel pads and soils near Prudhoe Bay, a control cell was left unassisted and untreated. This control cell represents, in essence, natural attenuation. Initial DRPH concentration was approximately 1,900 mg/kg. After nine weeks the DRPH concentration had decreased to 1,200 mg/kg. This indicates a reduction of 37 percent in DRPH concentration in 63 days. In addition, a slight increase in the microbial population was noted (Liddell et al. 1991). The difference between a control cell and undisturbed gravel is that the control cell material is oxygenated as it is placed in the cell. As a result, the rate and magnitude of reduction is probably greater than that for undisturbed soil or gravel. The estimated efficiency of no action is therefore 50 percent.

**Institutional Controls and Monitoring**. The bioremediation study noted above applies to this remedial alternative, and estimated efficiency is 50 percent.

**Containment**. Although no examples of maintaining freezing conditions to contain contaminants on the North Slope could be found for this FS, the method has been developed as an innovative technology in the lower 48 states. Low maintenance approaches of insulation and heat exchangers are also routinely used in Alaska to protect the integrity of structures by keeping the level of permafrost at or near the ground surface.

**TABLE 5-12. SUMMARY OF REMEDIAL ALTERNATIVES BY MEDIUM**

| MEDIUM | SITE | REMEDIAL ALTERNATIVES |
|---|---|---|
| Gravel | • Sewage Disposal Area (SS01)<br>• Drum Storage Area (ST02)<br>• Beach Diesel Tanks (SS03)<br>• Diesel Spills (SS05) | No action<br>Institutional controls and monitoring<br>Enhanced bioremediation<br>Land spreading |
| Tundra | • Sewage Disposal Area (SS01)<br>• Diesel Spills (SS05) | No action<br>Institutional controls and monitoring<br>Enhanced bioremediation |
| Soil beneath the Garage | • Garage (SS09) | No action<br>Institutional controls and monitoring<br>Containment<br>Enhanced bioremediation<br>Biosurfactants |

**Enhanced Bioremediation**. Enhanced bioremediation has been successfully implemented in the arctic environment to treat petroleum hydrocarbon contamination on the North Slope. Studies at Point Thompson and Kuparuk oil fields in Alaska show that enhanced bioremediation is an efficient method for reducing the concentration of petroleum hydrocarbons to a desired level within a relatively short time. The Point Thompson case study shows that 16,000 cubic yards of TPH-contaminated gravel with an initial concentration of 2,000 to 3,000 ppm was bioremediated to an average concentration of 285 ppm between July and September 1990 (Liddell et al. 1991).

The estimated remedial action efficiency of enhanced bioremediation is 94 percent based on case studies done in Alaska and estimates of biodegradation kinetics.

**Land Spreading**. Land spreading is a recognized method for remediating petroleum hydrocarbons in gravel in Alaska. There are established regulations for the approach. Ample space to spread the estimated volume of contaminated gravel in two-inch lifts on clean gravel is not available. Thicker lifts (e.g., six inches) would have to be negotiated. Absorbent materials will be used around the perimeter to prevent runoff from the addition of moisture. Based on the estimated volume of gravel, 13.5 acres are needed. The area will be fenced with a silt fence to minimize the migration of windborne particles from the area and to prevent exposure to visitors.

The estimated remedial efficiency for this approach is based on an assumption that it will fall between the efficiencies for enhanced bioremediation and natural biodegradation. This is based on the assumption that land spreading increases aeration, moisture will be added, and no nutrients are added.

**Biosurfactants**. Biosurfactants were used successfully to clean petroleum from rocks and underlying sands and soils in the Prince William Sound area in 1993 (Tesoro/PES 1993). They also were used successfully to clean hydrocarbon contamination from rocks and soils at a refinery in Kenai, Alaska in 1992 (Tesoro/PES 1992). Specific North Slope case studies have not been identified, but the site conditions, especially the shallow permafrost beneath the structures and existing drainage, should allow for easy collection of any materials introduced by this process. A wastewater discharge permit may be required.

The estimated remedial action efficiency for biosurfactants is 90 percent, based on a downward adjustment of the 97 percent reduction found in a case study done at the Tesoro Kenai Refinery (Tesoro/PES 1992). This efficiency should be possible under conditions found on the North Slope, however, it may be difficult to access all contaminated areas beneath the Garage (SS09).

**5.4.2.2 Project Costs**. A summary of project costs for the remedial alternatives is included in Tables 5-13 through 5-15. Detailed cost estimates for each remedial alternative are located in Attachment A.

**5.4.2.3 Contaminant Reduction**. The degree to which COCs will meet target cleanup levels (proposed remediation goals) for each alternative is summarized in Table 5-16. This measure is presented as post-remedial concentration, or the initial concentration multiplied by one minus the projected efficiency.

## TABLE 5-13. SUMMARY OF PROJECT COSTS FOR REMEDIAL ALTERNATIVES EVALUATED FOR GRAVEL

| REMEDIAL ALTERNATIVE | TECHNOLOGY TESTING | CAPITAL COST | TOTAL LABOR | OPERATING COST | ENVIRONMENTAL TESTING | CLOSURE COST | ADMINISTRATIVE AND OTHER INDIRECT COSTS | PRESENT VALUE |
|---|---|---|---|---|---|---|---|---|
| No action | $0 | $0 | $0 | $0 | $0 | $5,000 | $750 | $5,750 |
| Institutional controls and monitoring | $0 | $100 | $29,320 | $17,375 | $3,105 | $5,000 | $14,460 | $68,675 |
| Enhanced bioremediation | $7,500 | $4,390 | $74,505 | $48,575 | $3,105 | $4,320 | $36,500 | $178,890 |
| Land spreading | $7,500 | $19,795 | $95,265 | $60,300 | $1,550 | $4,320 | $48,055 | $236,285 |

## TABLE 5-14. SUMMARY OF PROJECT COSTS FOR REMEDIAL ALTERNATIVES EVALUATED FOR TUNDRA

| REMEDIAL ALTERNATIVE | TECHNOLOGY TESTING | CAPITAL COST | TOTAL LABOR | OPERATING COST | ENVIRONMENTAL TESTING | CLOSURE COST | ADMINISTRATIVE AND OTHER INDIRECT COSTS | PRESENT VALUE |
|---|---|---|---|---|---|---|---|---|
| No action | $0 | $0 | $0 | $0 | $0 | $5,000 | $750 | $5,750 |
| Institutional controls and monitoring | $0 | $100 | $29,320 | $17,375 | $1,550 | $4,320 | $14,040 | $66,700 |
| Enhanced bioremediation | $7,500 | $2,965 | $74,505 | $48,575 | $1,550 | $4,320 | $35,725 | $175,145 |

## TABLE 5-15. SUMMARY OF PROJECT COSTS FOR REMEDIAL ALTERNATIVES EVALUATED FOR SOIL BENEATH THE GARAGE (SS09)

| REMEDIAL ALTERNATIVE | TECHNOLOGY TESTING | CAPITAL COST | TOTAL LABOR | OPERATING COST | ENVIRONMENTAL TESTING | CLOSURE COST | ADMINISTRATIVE AND OTHER INDIRECT COSTS | PRESENT VALUE |
|---|---|---|---|---|---|---|---|---|
| No Action | $0 | $0 | $0 | $0 | $0 | $5,000 | $750 | $5,750 |
| Institutional Controls and Monitoring | $0 | $100 | $29,320 | $17,375 | $775 | $4,320 | $13,830 | $65,720 |
| Containment | $0 | $44,000 | $71,760 | $30,000 | $0 | $0 | $21,865 | $167,625 |
| Enhanced Bioremediation | $7,500 | $2,985 | $74,505 | $48,575 | $775 | $4,320 | $35,520 | $174,180 |
| Biosurfactants | $7,500 | $12,300 | $64,910 | $39,140 | $535 | $4,535 | $32,680 | $161,600 |

## TABLE 5-16. ESTIMATED POTENTIAL CONTAMINANT REDUCTION (ALL MEDIA)

| ALTERNATIVE | MEDIUM | CONTAMINANTS | MAXIMUM (AVERAGE*) CONCENTRATION OF DRPH (mg/kg) | TARGET CLEANUP LEVEL FOR DRPH[a] (mg/kg) | MAXIMUM (AVERAGE*) POST REMEDIAL CONCENTRATION FOR DRPH (mg/kg) |
|---|---|---|---|---|---|
| No action | Gravel | DRPH, GRPH, Benzene | 16,000 (6,430) | 500 | 8,000 (3,125) |
| | Tundra | DRPH | 6,600 (3,645) | 500 | 3,300 (1,825) |
| | Soil Beneath Garage | DRPH, GRPH, RRPH, PCE | 16,000 (10,700) | 500 | 8,000 (5,350) |
| Institutional controls and monitoring | Gravel | DRPH, GRPH, Benzene | 16,000 (6,430) | 500 | 3,300 (3,215) |
| | Tundra | DRPH | 6,600 (3,645) | 500 | 3,300 (1,825) |
| | Soil Beneath Garage | DRPH, GRPH, RRPH, PCE | 16,000 (10,700) | 500 | 8,000 (5,350) |
| Containment | Soil beneath Garage | DRPH, GRPH, RRPH, PCE | 16,000 (10,700) | 500 | 16,000 (10,700) |
| Enhanced bioremediation | Gravel | DRPH, GRPH, Benzene | 16,000 (6,430) | 500 | 960 (386) |
| | Tundra | DRPH | 6,600 (3,645) | 500 | 396 (220) |
| | Soil Beneath Garage | DRPH, GRPH, RRPH, PCE | 16,000 (10,700) | 500 | 960 (642) |
| Biosurfactants | Soil Beneath Garage | DRPH, GRPH, RRPH, PCE | 16,000 (10,700) | 500 | 1,600 (1,070) |
| Land spreading | Gravel | DRPH, GRPH, Benzene | 16,000 (6,430) | 500 | 4,000 (1,610) |

* The average concentration is conservatively calculated by averaging results that exceed the target cleanup level (i.e., non detects were not included).
a The target cleanup level for DRPH in soil is based on ADEC Non-UST guidance and does not necessarily correspond to site-specific cleanup goals.

**5.4.2.4 Project Duration**. A breakdown of the project durations for the remedial alternatives is shown in Tables 5-17 through 5-19. Detailed project duration tables for each of the alternatives are located in Attachment B.

**No Action**. Project duration for no action involves closure reporting only.

**Institutional Controls and Monitoring**. The duration of natural unassisted bioremediation for institutional controls and monitoring will be the same as that for no action, but there will be monitoring of this reduction. In this case, it is assumed that natural, unassisted biodegradation of COCs will show a clear trend towards the target cleanup level based on periodic sampling that will justify site closure within three years.

**Containment**. Project duration is assumed to be predominantly planning activities. The length of time the containment system would remain in place in uncertain and not included in the estimate. That length of time hinges either on a decision by the Air Force to dismantle the Garage or on the emergence of new remedial technology.

**Enhanced Bioremediation**. Project durations are based on the assumption that, in the case of enhanced bioremediation, reduction of maximum concentrations of COCs to target levels will occur within three years of the start of the project or show through periodic monitoring a clear trend in that direction. This clear trend will justify site closure even if the target cleanup level has not been met. Enhanced bioremediation will occur during summer months only because the gravel will be frozen the rest of the year. The target cleanup levels for DRPH and GRPH, again, are based on guidance and are negotiable with ADEC. Case studies cited support this approach and the average concentrations presented in Table 5-16 suggest that reduction could occur more quickly (see Figure 5-9).

**Land Spreading**. Several assumptions are made concerning land spreading based on case studies and best engineering judgement. Technology testing will be necessary for the alternative involving land spreading to determine its feasibility under site-specific conditions and to provide information for detailed design. Technology testing is expected to take about 60 days. This should not affect the start of the onsite remedial activities, provided that sufficient time is allowed for this to occur before other onsite activities begin. This duration assumes that thicker lifts have been negotiated successfully and that ample clean gravel surface is available.

**Biosurfactants**. Project duration in the field is very short because the technology can be employed rapidly. The majority of the estimated duration is related to planning activities including treatability testing and in the year after field activities are complete in which the petroleum hydrocarbons in rinse water are allowed to biodegrade in either a tank or drums.

**5.4.2.5 Data Gaps.**

**No Action**. The data gaps are the lack of information on the biodegradation potential and the immobility in the long term of tetrachloroethene beneath the Garage (SS09).

## TABLE 5-17. ESTIMATED PROJECT DURATION FOR REMEDIAL ALTERNATIVES EVALUATED FOR GRAVEL

| REMEDIAL ALTERNATIVE | DURATION OF ONSITE REMEDIAL ACTIVITY (Days) | TOTAL PROJECT DURATION (Days) (No. in Parenthesis is Time Predicted for Bioremediation to Reach Cleanup Level) |
|---|---|---|
| No action | 0 | 30 |
| Institutional controls and monitoring | 13 | 881 |
| Enhanced bioremediation | 23 | 988 |
| Land spreading | 44 | 919 |

## TABLE 5-18. ESTIMATED PROJECT DURATION FOR REMEDIAL ALTERNATIVES EVALUATED FOR TUNDRA

| REMEDIAL ALTERNATIVE | DURATION OF ONSITE REMEDIAL ACTIVITY (Days) | TOTAL PROJECT DURATION (Days) |
|---|---|---|
| No action | 0 | 30 |
| Institutional controls and monitoring | 13 | 881 |
| Enhanced bioremediation | 23 | 988 |

## TABLE 5-19. ESTIMATED PROJECT DURATION FOR REMEDIAL ALTERNATIVES EVALUATED FOR SOIL BENEATH THE GARAGE (SS09)

| REMEDIAL ALTERNATIVE | DURATION OF ONSITE REMEDIAL ACTIVITY (Days) | TOTAL PROJECT DURATION (Days) |
|---|---|---|
| No action | 0 | 30 |
| Institutional controls and monitoring | 13 | 881 |
| Containment | 22 | 119 |
| Enhanced bioremediation | 23 | 988 |
| Biosu[illegible]nts | 14 | 557 |

**Institutional Controls and Monitoring.** The data gaps are the lack of information on site-specific biodegradation potential and the immobility in the long term of tetrachloroethene beneath the Garage (SS09).

**Containment.** The data gaps relate to design specifications including the most appropriate method for maintaining freezing conditions and the method for accessing the underside of the Garage (SS09).

**Enhanced Bioremediation.** The data gap is the lack of information on the biodegradation potential. A treatability study will be necessary to determine the biodegradation potential of contaminants in each medium, and to determine the type and amount of nutrient additions to enhance biodegradation.

**Land Spreading.** The data gaps are the lack of information on site-specific biodegradation potential and the availability of ample clean gravel surface. A treatability study will be necessary to determine biodegradation potential. Several parameters must be investigated, including pH and baseline microbial activity. Lifts at least six inches thick would have to be negotiated with ADEC to land spread the estimated volume of gravel in three years. If thicker lifts cannot be negotiated, the project would take at least nine years to complete as described.

**Biosurfactants.** Accessibility and associated effectiveness of the air knives beneath the Garage (SS09) are the data gaps. Clearance between the buildings and the areas beneath them is variable and sometimes less than two feet. A treatability study will be necessary.

### 5.4.3 Summary of Detailed Evaluation of Remedial Alternatives

Tables 5-20 through 5-22 summarize the remedial alternatives evaluated by medium.

### 5.4.4 Summary of the Nine Criteria

This section consists of an evaluation of the proposed alternatives, and are analyzed according to the following nine criteria required in the NCP:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance; and
- Community acceptance.

State acceptance and community acceptance will be based on comments received on the RI/FS report and the proposed remedial alternative for each site.

## TABLE 5-20. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR GRAVEL

| SITES | REMEDIAL ALTERNATIVE | CONTAMINANTS | REMEDIAL ACTION EFFICIENCY | MAXIMUM (AVERAGE*) INITIAL CONCENTRATION (mg/kg) | TARGET CLEANUP LEVEL[a] (mg/kg) | MAXIMUM (AVERAGE*) POST REMEDIAL CONCENTRATION (mg/kg) | BENCH OR TREATABILITY STUDY REQUIRED | LEVEL OF WORKER PROTECTION | PROJECT DURATION (Months) | PROJECT COST |
|---|---|---|---|---|---|---|---|---|---|---|
| Sewage Disposal Area (SS01); Drum Storage Area (ST02); Beach Diesel Tanks (SS03); and Diesel Spills (SS05) | No action | DRPH | 50% | 16,000 (6,430) | 500 | 8,000 (3,125) | NO | D | 1 | $5,750 |
| | | GRPH | 50% | 1,000 (423) | 100 | 500 (212) | | | | |
| | Institutional controls and Monitoring | DRPH | 50% | 16,000 (6,430) | 500 | 8,000 (3,125) | NO | D | 30 | $68,675 |
| | | GRPH | 50% | 1,000 (423) | 100 | 500 (212) | | | | |
| | Enhanced bioremediation | DRPH | 94% | 16,000 (6,430) | 500 | 960 (386) | YES | D | 33 | $178,890 |
| | | GRPH | 94% | 1,000 (423) | 100 | 60 (25) | | | | |
| | Land spreading | DRPH | 75% | 16,000 (6,430) | 500 | 4,000 (1,610) | YES | D | 31 | $236,785 |
| | | GRPH | 75% | 1,000 (423) | 100 | 250 (106) | | | | |

* The average concentration is conservatively calculated by averaging results that exceed the target cleanup level (i.e., nondetects were not included).
a Target cleanup levels for DRPH and GRPH in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.

## TABLE 5-21. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR TUNDRA

| SITES | REMEDIAL ALTERNATIVE | CONTAMINANTS | REMEDIAL ACTION EFFICIENCY | MAXIMUM (AVERAGE*) INITIAL CONCENTRATION (mg/kg) | TARGET CLEANUP LEVEL[a] (mg/kg) | MAXIMUM (AVERAGE*) POST REMEDIAL CONCENTRATION (mg/kg) | BENCH OR TREATABILITY STUDY REQUIRED | LEVEL OF WORKER PROTECTION | PROJECT DURATION (Months) | PROJECT COST |
|---|---|---|---|---|---|---|---|---|---|---|
| Sewage Disposal Area (SS01) and Diesel Spills (SS05) | No action | DRPH | 50% | 6,600 (3,645) | 500 | 3,300 (1,825) | NO | D | 1 | $5,750 |
| | | Benzene | 50% | 1.2 (1.2) | 0.5 | 0.6 (0.6) | | | | |
| | Institutional controls and monitoring | DRPH | 50% | 6,600 (3,645) | 500 | 3,300 (1,825) | NO | D | 30 | $66,705 |
| | | Benzene | 50% | 1.2 (1.2) | 0.5 | 0.6 (0.6) | | | | |
| | Enhanced bioremediation | DRPH | 94% | 6,600 (3,645) | 500 | 396 (220) | YES | D | 33 | $175,145 |
| | | Benzene | 94% | 1.2 (1.2) | 0.5 | <0.5 (<0.5) | | | | |

* The average concentration is conservatively calculated by averaging results that exceed the target cleanup level (i.e., nondetects were not included).
a Target cleanup levels for DRPH and benzene in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.

## TABLE 5-22. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL BENEATH THE GARAGE (SS09)

| SITE | REMEDIAL ALTERNATIVE | CONTAMINANTS | REMEDIAL ACTION EFFICIENCY | MAXIMUM (AVERAGE*) INITIAL CONCENTRATION (mg/kg) | TARGET CLEANUP LEVEL[a] (mg/kg) | MAXIMUM (AVERAGE*) POST REMEDIAL CONCENTRATION (mg/kg) | BENCH OR TREATABILITY STUDY REQUIRED | LEVEL OF WORKER PROTECTION | PROJECT DURATION (Months) | PROJECT COST |
|---|---|---|---|---|---|---|---|---|---|---|
| Garage (SS09) | No action | DRPH | 50% | 16,000 (10,700) | 500 | 8,000 (5,350) | NO | D | 1 | $5,750 |
| | | GRPH | 50% | 400 (270) | 100 | 200 (135) | | | | |
| | | RRPH | 50% | 16,000 (5,700) | 2,000 | 5,000 (2,850) | | | | |
| | | Tetrachloroethene | 50% | 18 (12.3) | 12.3 | 9 (6) | | | | |
| | Institutional controls and Monitoring | DRPH | 50% | 16,000 (10,700) | 500 | 8,000 (5,350) | NO | D | 30 | $65,720 |
| | | GRPH | 50% | 400 (270) | 100 | 200 (135) | | | | |
| | | RRPH | 50% | 10,000 (5,700) | 2,000 | 5,000 (2,850) | | | | |
| | | Tetrachloroethene | 50% | 18 (12.3) | 12.3 | 9 (6) | | | | |
| | Containment | DRPH | 90%[b] | 16,000 (10,700) | 500 | 16,000 (10,700) | NO | D | 4 | $167,625 |
| | | GRPH | 90%[b] | 400 (270) | 100 | 400 (270) | | | | |
| | | RRPH | 90%[b] | 10,000 (5,700) | 2,000 | 10,000 (5,700) | | | | |
| | | Tetrachloroethene | 90%[b] | 18 (12.3) | 12.3 | 18 (12.3) | | | | |

* The average concentration is conservatively calculated by averaging results that exceed the target cleanup level (i.e., nondetects were not included).
a Target cleanup levels for DRPH, GRPH, and RRPH in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.
b Ninety percent refers to a reduction in contaminant mobility in soil beneath the garage. Since containment does not reduce contaminant concentrations, the 90 percent is not factored into post remedial concentration.

## TABLE 5-22. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL BENEATH THE GARAGE (SS09) (CONTINUED)

| SITE | REMEDIAL ALTERNATIVE | CONTAMINANTS | REMEDIAL ACTION EFFICIENCY | MAXIMUM (AVERAGE*) INITIAL CONCENTRATION (mg/kg) | TARGET CLEANUP LEVEL[a] (mg/kg) | MAXIMUM (AVERAGE*) POST REMEDIAL CONCENTRATION (mg/kg) | BENCH OR TREATABILITY STUDY REQUIRED | LEVEL OF WORKER PROTECTION | PROJECT DURATION (Months) | PROJECT COST |
|---|---|---|---|---|---|---|---|---|---|---|
| | Enhanced bioremediation | DRPH | 94% | 16,000 (10,700) | 500 | 960 (642) | YES | D | 33 | $174,180 |
| | | GRPH | 94% | 400 (270) | 100 | 24 (16) | | | | |
| | | RRPH | 94% | 10,000 (5,700) | 2,000 | 600 (342) | | | | |
| | | Tetrachloroethene | 94% | 18 (12.3) | 12.3 | 1 (<1) | | | | |
| | Biosurfactants | DRPH | 90% | 16,000 (10,700) | 500 | 1,600 (1,070) | YES | C | 19 | $161,605 |
| | | GRPH | 90% | 400 (270) | 100 | 40 (27) | | | | |
| | | RRPH | 90% | 10,000 (5,700) | 2,000 | 1,000 (570) | | | | |
| | | Tetrachloroethene | 90% | 18 (12.3) | 12.3 | 2 (1) | | | | |

* The average concentration is conservatively calculated by averaging results that exceed the target cleanup level (i.e., nondetects were not included).
a Target cleanup levels for DRPH, GRPH, and RRPH in soil are based on ADEC Non-UST guidance and do not necessarily correspond to final site-specific cleanup goals.

The evaluation of the nine criteria is presented in Tables 5-23 through 5-25. The following definitions of the nine criteria, taken from the EPA RI/FS Guidance Document and the NCP, were used:

**Overall Protection of Human Health and the Environment**. This criterion addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

**Compliance with ARARs**. This criterion addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and/or provide grounds for invoking a waiver.

**Long-Term Effectiveness and Permanence**. This criterion refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

**Reduction of Toxicity, Mobility, or Volume Trough Treatment**. This criterion is the anticipated performance of the treatment technologies a remedy may employ (reflects the anticipated performance of treatment).

**Short-Term Effectiveness**. This criterion addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

**Implementability**. This criterion is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

**Cost**. Cost includes estimated capital and operation and maintenance costs, and net present work costs.

**State Acceptance**. State acceptance addresses the technical or administrative issues and concerns the support agency may have regarding each alternative.

**Community Acceptance**. Community acceptance addresses the issues and concerns the public may have regarding each of the alternatives.

### 5.4.5 Preferred Alternative

The preferred alternatives for the media at the six sites are presented in Table 5-26. The preferred alternative for the gravel, tundra, and soil beneath the Garage (SS09) at the five sites at the Point Lonely radar installation requiring remediation [other than POL Storage (SS04)] is enhanced bioremediation. This alternative meets the target cleanup levels for gravel and tundra, and is expected to closely approach the target cleanup level for the soil beneath the Garage (SS09). Tetrachloroethene in soil beneath the Garage (SS09) is only slightly higher than the

## TABLE 5-23. EVALUATION OF NINE CRITERIA FOR GRAVEL

| CRITERIA | No Action | Institutional Controls and Monitoring | Enhanced Bioremediation | Land Spreading |
|---|---|---|---|---|
| 1. Overall Protection of Human Health and the Environment | This alternative may not be completely protective of human health and the environment because it may not comply with all chemical-specific ARARs. Therefore, it may not provide sufficient long-term effectiveness and permanence. | This alternative may not be completely protective of human health and the environment because it may not comply with all chemical-specific ARARs. Therefore, it may not provide sufficient long-term effectiveness and permanence. | This alternative is protective of human health and the environment because it complies with all ARARs, provides long-term effectiveness and permanence, and provides short-term effectiveness. | This alternative is protective of human health and the environment because it complies with all ARARs, provides long-term effectiveness and permanence, and provides short-term effectiveness, though it may not comply with chemical-specific ARARs. There may also be insufficient space to spread gravel. |
| 2. Compliance with ARARs | The use of this technology will comply with action specific and location specific ARARs, but may not provide enough reduction to comply with chemical specific ARARs if unassisted bioremediation is unsuccessful. | The use of this technology will comply with action specific and location specific ARARs, but may not provide enough reduction to comply with chemical specific ARARs if unassisted bioremediation is unsuccessful. | The use of this technology will comply with all action specific, and location specific ARARs. Chemical specific ARARs are met if average concentrations are used. | The use of this technology may not comply with all chemical specific if natural biodegradation is unsuccessful. |
| 3. Long-Term Effectiveness and Permanence | This alternative may not provide long-term effectiveness because of uncertainties regarding unassisted bioremediation potential of the medium. | This alternative may not provide long-term effectiveness because of uncertainties regarding unassisted bioremediation potential of the medium. | This alternative provides sufficient long-term effectiveness because the estimated residual COC concentrations are below relevant risk and hazard levels, and are below relevant action levels. It provides permanence because COCs are irreversibly transformed to non-hazardous by-products. | This alternative provides sufficient long-term effectiveness because the estimated residual COC concentrations are below relevant risk and hazard levels. It provides permanence because COCs are removed from the contaminated medium or irreversibly transformed to non-hazardous byproducts. |
| 4. Reduction of Toxicity, Mobility, and Volume Through Treatment | Results in a reduction in toxicity through natural biodegradation. | Results in a reduction in toxicity through natural biodegradation. | Results in a reduction in toxicity through treatment. | Results in a reduction in toxicity through treatment. |
| 5. Short-Term Effectiveness | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. |

## TABLE 5-23. EVALUATION OF NINE CRITERIA FOR GRAVEL (CONTINUED)

| CRITERIA | No Action | Institutional Controls and Monitoring | Enhanced Bioremediation | Land Spreading |
|---|---|---|---|---|
| 6. Implementability | This alternative should be technically and administratively implementable, provided that the risk management decisions are acceptable to ADEC. | This alternative is technically and administratively implementable. | Technical implementability will be determined by performing a treatability study. Administrative implementability issues include securing permit. Materials are readily available. | This alternative is probably not technically implementable because space is not available for spreading unless a solid waste disposal permit can be negotiated with thicker lifts (e.g., 6 inches). Materials are readily available. |
| 7. Cost | $5,750 | $68,675 | $178,890 | $236,785 |
| 8. State/Support Agency | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. |
| 9. Community Acceptance | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. |

## TABLE 5-24. EVALUATION OF NINE CRITERIA FOR TUNDRA

| CRITERIA | No Action | Institutional Controls and Monitoring | Enhanced Bioremediation |
|---|---|---|---|
| 1. Overall Protection of Human Health and the Environment | This alternative may not be completely protective of human health and the environment because it may not comply with all chemical-specific ARARs. Therefore, it may not provide sufficient long-term effectiveness and permanence. | This alternative may not be completely protective of human health and the environment because it may not comply with all chemical-specific ARARs. Therefore, it may not provide sufficient long-term effectiveness and permanence. | This alternative is protective of human health and the environment because it complies with all ARARs, provides long-term effectiveness and permanence, and provides short-term effectiveness. |
| 2. Compliance with ARARs | The use of this technology will comply with action specific and location specific ARARs, but may not provide enough reduction to comply with chemical specific ARARs if unassisted bioremediation is unsuccessful. | The use of this technology will comply with action specific and location specific ARARs, but may not provide enough reduction to comply with chemical specific ARARs if unassisted bioremediation is unsuccessful. | The use of this technology will comply with all chemical specific, action specific, and location specific ARARs. |
| 3. Long-Term Effectiveness and Permanence | This alternative may not provide sufficient long-term effectiveness because some residual COC concentrations are above relevant action levels. | This alternative may not provide sufficient long-term effectiveness because some residual COC concentrations are above relevant action levels. | This alternative provides sufficient long-term effectiveness because the estimated residual COC concentrations are below relevant risk and hazard levels. It provides permanence because COCs are irreversibly transformed to non-hazardous by-products. |
| 4. Reduction of Toxicity, Mobility, and Volume Through Treatment | Results in a reduction in toxicity through natural biodegradation. | Results in a reduction in toxicity through natural biodegradation. | Results in a reduction in toxicity through treatment. |
| 5. Short-Term Effectiveness | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. |
| 6. Implementability | This alternative should be technically and administratively implementable, provided that the risk management decisions are acceptable to ADEC. | This alternative is technically and administratively implementable. | Technical implementability will be determined by performing a treatability study. Administrative implementability issues include securing permit. Materials are readily available. |
| 7. Cost | $5,750 | $66,705 | $175,145 |
| 8. State/Support Agency | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. |
| 9. Community Acceptance | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. |

## TABLE 5-25. EVALUATION OF NINE CRITERIA FOR SOIL BENEATH THE GARAGE (SS09)

| CRITERIA | No Action | Institutional Controls and Monitoring | Containment | Enhanced Bioremediation | Biosurfactants |
|---|---|---|---|---|---|
| 1. Overall Protection of Human Health and the Environment | This alternative may not be completely protective of human health and the environment because it may not comply with all chemical-specific ARARs. Therefore, it may not provide sufficient long-term effectiveness and permanence. | This alternative may not be completely protective of human health and the environment because it may not comply with all chemical-specific ARARs. Therefore, it may not provide sufficient long-term effectiveness and permanence. | This alternative is protective of human health and the environment as a temporary measure as long as freezing conditions are maintained. | This alternative is protective of human health and the environment because it complies with all ARARs, provides long-term effectiveness and permanence, and provides short-term effectiveness. | This alternative is protective of human health and the environment because it complies with all ARARs, provides long-term effectiveness and permanence, and provides short-term effectiveness. |
| 2. Compliance with ARARs | The use of this technology will comply with action specific and location specific ARARs, but may not provide enough reduction to comply with chemical specific ARARs if unassisted bioremediation is unsuccessful. | The use of this technology will comply with action specific and location specific ARARs, but may not provide enough reduction to comply with chemical specific ARARs if unassisted bioremediation is unsuccessful. | This alternative complies with action-specific and location-specific ARARs. It does not comply with chemical-specific ARARs. | The use of this technology will comply with all action specific, and location specific ARARs. It comes close to meeting chemical-specific ARARs if average concentration is used. | The use of this technology may not comply with all chemical specific, action specific, and location specific ARARs. |
| 3. Long-Term Effectiveness and Permanence | This alternative may not provide long-term effectiveness because of uncertainties regarding the bioremediation potential and the immobility of contaminants in the soil beneath the Garage (SS09). | This alternative may not provide long-term effectiveness because of uncertainties regarding the bioremediation potential and the immobility of contaminants in the soil beneath the Garage (SS09). | This alternative does not provide long term effectiveness or permanence. It is intended to be a temporary measure. | This alternative provides sufficient long-term effectiveness because the estimate residual COC concentrations are below relevant risk and hazard levels, and are below relevant action levels. It provides permanence because COCs are irreversibly transformed to non-hazardous by-products. It assumes the continued immobility of tetrachloroethene beneath the Garage (SS09). | This alternative provides sufficient long-term effectiveness because the estimate residual COC concentrations are below relevant risk and hazard levels. It provides permanence because COCs are removed from the contaminated medium or irreversibly transformed to non-hazardous byproducts. |
| 4. Reduction of Toxicity, Mobility, and Volume Through Treatment | Results in a reduction in toxicity through natural biodegradation. | Results in a reduction in toxicity through natural biodegradation. | Results in no reduction in toxicity through treatment. | Results in a reduction in toxicity through treatment. | Results in a reduction in toxicity through treatment. |

## TABLE 5-25. EVALUATION OF NINE CRITERIA FOR SOIL BENEATH THE GARAGE (SS09) (CONTINUED)

| CRITERIA | No Action | Institutional Controls and Monitoring | Containment | Enhanced Bioremediation | Biosurfactants |
|---|---|---|---|---|---|
| 5. Short-Term Effectiveness | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. | This alternative will present no detrimental effect on the environment or surrounding area. Workers may be exposed to COCs and difficult working conditions beneath the Garage. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level D. | This alternative will not present any detrimental effect on the environment, the surrounding community, or workers. Recommended worker protection is level C since biosurfactants may act as an irritant. |
| 6. Implementability | This alternative should be technically and administratively implementable, provided that the risk management decisions are acceptable to ADEC. | This alternative is technically and administratively implementable. | This alternative should be technically and administratively implementable. | Technical implementability will be determined by performing a treatability study. Administrative implementability issues include securing permit. Materials are readily available. | This alternative should be technically implementable if runoff can be controlled and all of the contamination accessed. A treatability study will be performed. Administrative implementability issues include securing permit. Materials are readily available. |
| 7. Cost | $5,750 | $65,720 | $167,625 | $174,180 | $161,605 |
| 8. State/Support Agency | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. | ADEC will be involved in review and selection of remedial alternatives. |
| 9. Community Acceptance | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. | Community Relations Plan is being implemented and community concerns will be addressed in a responsiveness summary. |

## TABLE 5-26. PREFERRED REMEDIAL ACTION ALTERNATIVES

| SITE NAME | SITE ID NUMBER | MEDIUM | PREFERRED ALTERNATIVE |
|---|---|---|---|
| Sewage Disposal Area | SS01 | Gravel | Enhanced bioremediation |
| | | Tundra | Enhanced bioremediation |
| Drum Storage Area | ST02 | Gravel | Enhanced bioremediation |
| Beach Diesel Tanks | SS03 | Gravel | Enhanced bioremediation |
| POL Storage | SS04 | Tundra | Offsite disposal of drums |
| Diesel Spills | SS05 | Gravel | Enhanced bioremediation |
| | | Tundra | Enhanced bioremediation |
| Garage | SS09 | Soil beneath garage | Enhanced bioremediation |

target cleanup level and is assumed to be immobile based on samples from the drainage channels. In addition, the cost estimate is significantly lower than the other alternatives that involve active treatment, largely because of the need for less labor and equipment. The cost estimate for enhanced bioremediation at the five sites is:

| | |
|---|---|
| Gravel | \$178,885 |
| Tundra | \$175,145 |
| Soil beneath the garage | \$174,180 |
| TOTAL | \$528,210 |

The estimated costs include the redundant costs for planning documents, labor, mobilization, and other costs. If redundant costs are eliminated from the estimated cost (if all site remediation was combined), enhanced bioremediation costs for the five combined sites is estimated to be \$181,995. A detailed cost estimate for enhanced bioremediation of the combined sites is included in Attachment A.

The presumptive remedy for POL Storage (SS04) is sampling the nearby drums for waste characterization, disposing of the drums offsite, and sampling surface water. The estimated cost of this activity is \$81,575. The total estimated cost of enhanced bioremediation of the five sites and characterizing and removing drums at the POL Storage (SS04) is:

| | |
|---|---|
| Enhanced Bioremediation | \$181,995 |
| Presumptive Remedy for POL Storage (SS04) | \$ 81,575 |
| TOTAL | \$263,570 |

These two alternatives are considered stand-alone projects, and costs were estimated as such. If a coordinated approach to remediation is used, further savings may be realized in preparation of planning documents, mobilization and demobilization, onsite labor, and transportation of

equipment and samples. In addition, the volume of material that must be treated has been estimated based on RI sampling and analyses. The actual volume may be reduced or increased by field screening during remediation.

## 5.5 SITING STUDY

Siting of remedial equipment should not be a major concern at Point Lonely, since no large remedial units will be used.

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## ATTACHMENT A
## COST ESTIMATES

# Presumptive Remedy for the POL Storage Area: Characterization and Off-Site Disposal of Drums

## Estimated Costs

| Site: | Media: | Tundra | |
|---|---|---|---|
| POL Storage Area (SS04) | Total volume: | 2 CY | |
| | Project duration: | 4 Months | (101 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (Work plan, SAP, QAPjP, H&S) | 2 | Report | $2,500.00 | $5,000 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $100.00 | $100 | |
| Salvage Drums | 3 | Drum | $85.00 | $255 | |
| Total Capital Cost over the 4 Month Project | | | | $5,355 | $0 |
| OPERATING COSTS: | | | | | |
| Drum transportation | 1 | Event | $30,000.00 | $30,000 | |
| Drum Disposal | 1,155 | Lbs | $2.00 | $2,310 | |
| Sampling | 1 | Event | $400.00 | $400 | |
| Waste Profiling | 1 | Profile | $250.00 | $250 | |
| Labor | 208 | Hr | $70.00 | $14,560 | |
| Per Diem and Travel | 26 | Days | $200.00 | $5,200 | |
| Project Management | 31 | Hr | $70.00 | $2,184 | |
| Closure (Month 4) | 1 | Report | $5,000.00 | $5,000 | |
| Total Operating Cost over the 4 Month Project | | | | $59,904 | $0 |
| Total Direct Cost over the 4 Month Project | | | | $65,259 | $0 |
| Procurement costs (5%) | | | | $3,263 | $0 |
| Overhead (10%) | | | | $6,526 | $0 |
| Contingency (10%) | | | | $6,526 | $0 |
| Total Administrative Cost over the 4 Month Project | | | | $16,315 | $0 |
| NET PRESENT WORTH | | | | | **$81,574** |

* Estimated discount rate for calculating present value of future costs

# Alternative: No Action
## Estimated Costs

| Sites: | Media: | Gravel | |
|---|---|---|---|
| Sewage Disposal Area (SS01), Drum | Total volume: | 3,641 CY | |
| Storage Area (ST02), Beach Diesel | Project duration: | 1 Month | (30 days) |
| Tanks (SS03), and Diesel Spills (SS05) | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Total Capital Cost over the 1 Month Project | | | | $0 | $0 |
| OPERATING COSTS: | | | | | |
| Closure | 1 | Event | $5,000.00 | $5,000 | |
| Total Capital Cost over the 1 Month Project | | | | $5,000 | $0 |
| Total Capital Cost over the 1 Month Project | | | | $5,000 | $0 |
| Procurement costs (0%) | | | | $0 | $0 |
| Overhead (10%) | | | | $500 | $0 |
| Contingency (5%) | | | | $250 | $0 |
| Total Capital Cost over the 1 Month Project | | | | $750 | $0 |
| NET PRESENT WORTH | | | | | **$5,750** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Institutional Controls and Monitoring
## Estimated Costs

| | | | |
|---|---|---|---|
| Sites: | Media: | Gravel | |
| Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), Diesel Spills (SS05) | Total volume: | 3,641 CY | |
| | Project duration: | 30 Months | (881 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (Work plan, SAP, QAPjP, H&S) | 2 | Report | $5,000.00 | $10,000 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $100.00 | $100 | |
| Total Capital Cost over the 30 Month Project | | | | $10,100 | $0 |
| OPERATING COSTS: | | | | | |
| Implement Institutional Controls | 1 | Event | $10,000.00 | $10,000 | |
| Initial sampling | 16 | Samples | $70.00 | $1,120 | |
| Annual sampling | 2 | Event | $1,120.00 | | $2,240 |
| Labor | 240 | Hr | $70.00 | $16,800 | |
| Per Diem | 30 | Days | $175.00 | $5,250 | |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 36 | Hr | $70.00 | $2,520 | |
| Closure (Month 30) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 30 Month Project | | | | $35,690 | $12,040 |
| Total Direct Cost over the 30 Month Project | | | | $45,790 | $12,040 |
| Procurement costs (5%) | | | | $2,290 | $602 |
| Overhead (10%) | | | | $4,579 | $1,204 |
| Contingency (10%) | | | | $4,579 | $1,204 |
| Total Administrative Cost over the 30 Month Project | | | | $11,448 | $3,010 |
| NET PRESENT WORTH | | | | | **$68,675** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Enhanced Bioremediation

## Estimated Costs

| Sites: | Media: | Gravel | |
|---|---|---|---|
| Sewage Disposal Area (SS01), Drum | Total volume: | 3,641 CY | |
| Storage Area (ST02), Beach Diesel | Project duration: | 33 Months | (988 days) |
| Tanks (SS03), Diesel Spills (SS05) | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (RD/RA) (Work plan, SAP, QAPjP, H&S) | 3 | Report | $5,000.00 | $15,000 | |
| Develop Specifications (30%, 95%, 100%) | 3 | Report | $5,000.00 | $15,000 | |
| Permitting (Air or Water) | 1 | Permit | $2,000.00 | $2,000 | |
| Treatability study | 1 | Study | $7,500.00 | $7,500 | |
| Nutrients | 1,456 | Lb | $1.00 | $1,456 | |
| Empty sand bags | 46 | Bag | $0.47 | $22 | |
| Hose | 1 | Hose | $50.00 | $50 | |
| Booms | 5 | Boom | $24.53 | $123 | |
| Trash pump | 2 | Month | $420.00 | $840 | |
| Personal H & S Expendibles | 90 | Day | $10.00 | $900 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $1,000.00 | $1,000 | |
| Total Capital Cost over the 33 Month Project | | | | $43,891 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilize/Demobilize | 1 | Event | $30,000.00 | $30,000 | |
| Transport Nutrients | | | | | |
| Transport Equipment | | | | | |
| Labor | 528 | Hr | $70.00 | $36,960 | |
| Per diem | 94 | Day | $175.00 | $16,450 | |
| Sampling & Analysis (initial) | 16 | Sample | $70.00 | $1,120 | |
| Sampling & Analysis (annual) | 2 | Event | $1,120.00 | | $2,240 |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 79 | Hr | $70.00 | $5,544 | |
| Closure (Month 33) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 33 Month Project | | | | $90,074 | $12,040 |
| Total Direct Cost over the 33 Month Project | | | | $133,965 | $12,040 |
| Procurement costs (5%) | | | | $6,698 | $602 |
| Overhead (10%) | | | | $13,396 | $1,204 |
| Contingency (10%) | | | | $13,396 | $1,204 |
| Total Administrative Cost over the 33 Month Project | | | | $33,491 | $3,010 |
| NET PRESENT WORTH | | | | | **$178,893** |

* Estimated discount rate for calculating present value of future costs

## Alternative: Land Spreading

## Estimated Costs

| Sites: | Media: | Gravel | |
|---|---|---|---|
| Sewage Disposal Area (SS01), Drum | Total volume: | 3,641 CY | |
| Storage Area (ST02), Beach Diesel | Project duration: | 31 Months | (919 days) |
| Tanks (SS03), Diesel Spills (SS05) | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents | 3 | Report | $5,000.00 | $15,000 | |
| (Work plan (or Landspreading Plan), QAPjP, and HASP) | 2 | Report | $5,000.00 | $10,000 | |
| Solid Waste Disposal Permit | 1 | Permit | $2,000.00 | $2,000 | |
| Treatability study | 1 | Study | $7,500.00 | $7,500 | |
| Back Hoe Rental | 1 | Month | $15,000 | $15,000 | |
| Empty sand bags | 46 | Bag | $0.47 | $22 | |
| Hose | 500 | LF | $1.00 | $500 | |
| Absorbant for runoff control | 222 | LF | $2.00 | $443 | |
| Trash pump | 3 | Month | $420.00 | $1,260 | |
| Personal H & S Expendibles | 157 | Day | $10.00 | $1,570 | |
| Silt Fencing | 1 | Lump Sum | $1,000.00 | $1,000 | |
| Total Capital Cost over the 31 Month Project | | | | $54,295 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilization of equipment for Landspreading | 1 | Event | $30,000.00 | $30,000 | |
| Labor | 848 | Hr | $70.00 | $59,360 | |
| Per diem | 161 | Day | $175.00 | $28,175 | |
| Sampling & Analysis (initial) | 8 | Sample | $70.00 | $560 | |
| Sampling & Analysis (annual) | 2 | Event | $560.00 | | $1,120 |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 127 | Hr | $70.00 | $8,904 | |
| Closure (Month 31) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 31 Month Project | | | | $126,999 | $10,920 |
| Total Direct Cost over the 31 Month Project | | | | $181,294 | $10,920 |
| Procurement costs (5%) | | | | $9,065 | $546 |
| Overhead (10%) | | | | $18,129 | $1,092 |
| Contingency (10%) | | | | $18,129 | $1,092 |
| Total Administrative Cost over the 31 Month Project | | | | $45,324 | $2,730 |
| NET PRESENT WORTH | | | | | **$236,783** |

* Estimated discount rate for calculating present value of future costs

## Alternative: No Action
## Estimated Costs

| Site: | Media: | Tundra | |
|---|---|---|---|
| Sewage Disposal Area (SS01) | Total volume: | 119 CY | |
| Diesel Spills (SS05) | Project duration: | 1 Month | (30 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Total Capital Cost over the 1 Month Project | | | | $0 | $0 |
| OPERATING COSTS: | | | | | |
| Closure | 1 | Event | $5,000.00 | $5,000 | |
| Total Capital Cost over the 1 Month Project | | | | $5,000 | $0 |
| Total Capital Cost over the 1 Month Project | | | | $5,000 | $0 |
| Procurement costs (0%) | | | | $0 | $0 |
| Overhead (10%) | | | | $500 | $0 |
| Contingency (5%) | | | | $250 | $0 |
| Total Capital Cost over the 1 Month Project | | | | $750 | $0 |
| NET PRESENT WORTH | | | | | **$5,750** |

* Estimated discount rate for calculating present value of future costs

## Alternative: Institutional Controls and Monitoring
## Estimated Costs

| | | | |
|---|---|---|---|
| Site: | Media: | Tundra | |
| Sewage Disposal Area (SS01) | Total volume: | 119 CY | |
| Diesel Spills (SS05) | Project duration: | 30 Months | (881 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (Work plan, SAP, QAPjP, H&S) | 2 | Report | $5,000.00 | $10,000 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $100.00 | $100 | |
| Total Capital Cost over the 30 Month Project | | | | $10,100 | $0 |
| OPERATING COSTS: | | | | | |
| Implement Institutional Controls | 1 | Event | $10,000.00 | $10,000 | |
| Initial sampling | 8 | Samples | $70.00 | $560 | |
| Annual sampling | 2 | Event | $560.00 | | $1,120 |
| Labor | 240 | Hr | $70.00 | $16,800 | |
| Per Diem | 30 | Days | $175.00 | $5,250 | |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 36 | Hr | $70.00 | $2,520 | |
| Closure (Month 30) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 30 Month Project | | | | $35,130 | $10,920 |
| Total Direct Cost over the 30 Month Project | | | | $45,230 | $10,920 |
| Procurement costs (5%) | | | | $2,262 | $546 |
| Overhead (10%) | | | | $4,523 | $1,092 |
| Contingency (10%) | | | | $4,523 | $1,092 |
| Total Administrative Cost over the 30 Month Project | | | | $11,308 | $2,730 |
| NET PRESENT WORTH | | | | | **$66,703** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Enhanced Bioremediation
## Estimated Costs

| | | | |
|---|---|---|---|
| Site: | Media: | Tundra | |
| Sewage Disposal Area (SS01) | Total volume: | 119 CY | |
| Diesel Spills (SS05) | Project duration: | 33 Months | (988 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (RD/RA) | 3 | Report | $5,000.00 | $15,000 | |
| (Work plan, SAP, QAPjP, H&S) | | | | | |
| Develop Specifications | 3 | Report | $5,000.00 | $15,000 | |
| (30%, 95%, 100%) | | | | | |
| Permitting (Air or Water) | 1 | Permit | $2,000.00 | $2,000 | |
| Treatability study | 1 | Study | $7,500.00 | $7,500 | |
| Nutrients | 48 | Lb | $1.00 | $48 | |
| Empty sand bags | 15 | Bag | $0.47 | $7 | |
| Hose | 1 | Hose | $50.00 | $50 | |
| Booms | 5 | Boom | $24.53 | $123 | |
| Trash pump | 2 | Month | $420.00 | $840 | |
| Personal H & S Expendibles | 90 | Day | $10.00 | $900 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $1,000.00 | $1,000 | |
| Total Capital Cost over the 33 Month Project | | | | $42,467 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilize/Demobilize | 1 | Event | $30,000.00 | $30,000 | |
| Transport Nutrients | | | | | |
| Transport Equipment | | | | | |
| Labor | 528 | Hr | $70.00 | $36,960 | |
| Per diem | 94 | Day | $175.00 | $16,450 | |
| Sampling & Analysis (initial) | 8 | Sample | $70.00 | $560 | |
| Sampling & Analysis (annual) | 2 | Event | $560.00 | | $1,120 |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 79 | Hr | $70.00 | $5,544 | |
| Closure (Month 33) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 33 Month Project | | | | $89,514 | $10,920 |
| Total Direct Cost over the 33 Month Project | | | | $131,981 | $10,920 |
| Procurement costs (5%) | | | | $6,599 | $546 |
| Overhead (10%) | | | | $13,198 | $1,092 |
| Contingency (10%) | | | | $13,198 | $1,092 |
| Total Administrative Cost over the 33 Month Project | | | | $32,995 | $2,730 |
| NET PRESENT WORTH | | | | | **$175,143** |

* Estimated discount rate for calculating present value of future costs

## Alternative: No Action

## Estimated Costs

| | | |
|---|---|---|
| Site: | Media: | Soil beneath Garage |
| Garage (SS09) | Total volume: | 167 CY |
| | Project duration: | 1 Month (30 days) |
| | Discount rate: | 5% * |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Total Capital Cost over the 1 Month Project | | | | $0 | $0 |
| OPERATING COSTS: | | | | | |
| Closure | 1 | Event | $5,000.00 | $5,000 | |
| Total Capital Cost over the 1 Month Project | | | | $5,000 | $0 |
| Total Capital Cost over the 1 Month Project | | | | $5,000 | $0 |
| Procurement costs (0%) | | | | $0 | $0 |
| Overhead (10%) | | | | $500 | $0 |
| Contingency (5%) | | | | $250 | $0 |
| Total Capital Cost over the 1 Month Project | | | | $750 | $0 |
| NET PRESENT WORTH | | | | | **$5,750** |

* Estimated discount rate for calculating present value of future costs

## Alternative: Institutional Controls and Monitoring
## Estimated Costs

| | | |
|---|---|---|
| Site: | Media: | Soil beneath Garage |
| Garage (SS09) | Total volume: | 167 CY |
| | Project duration: | 30 Months (881 days) |
| | Discount rate: | 5% * |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (Work plan, SAP, QAPjP, H&S) | 2 | Report | $5,000.00 | $10,000 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $100.00 | $100 | |
| Total Capital Cost over the 30 Month Project | | | | $10,100 | $0 |
| OPERATING COSTS: | | | | | |
| Implement Institutional Controls | 1 | Event | $10,000.00 | $10,000 | |
| Initial sampling | 4 | Samples | $70.00 | $280 | |
| Annual sampling | 2 | Event | $280.00 | | $560 |
| Labor | 240 | Hr | $70.00 | $16,800 | |
| Per Diem | 30 | Days | $175.00 | $5,250 | |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 36 | Hr | $70.00 | $2,520 | |
| Closure (Month 30) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 30 Month Project | | | | $34,850 | $10,360 |
| Total Direct Cost over the 30 Month Project | | | | $44,950 | $10,360 |
| Procurement costs (5%) | | | | $2,248 | $518 |
| Overhead (10%) | | | | $4,495 | $1,036 |
| Contingency (10%) | | | | $4,495 | $1,036 |
| Total Administrative Cost over the 30 Month Project | | | | $11,238 | $2,590 |
| NET PRESENT WORTH | | | | | **$65,718** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Containment

## Estimated Costs

| | | | |
|---|---|---|---|
| Sites: | Media: | Soil beneath Garage | |
| Garage (SS09) | Total volume: | 167 CY | |
| | Project duration: | 4 Months | (119 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (RD/RA) (Work plan, SAP, QAPjP, H&S) | 3 | Report | $5,000.00 | $15,000 | |
| Insulation | 4,500 | Sq Ft | $2.00 | $9,000 | |
| Gravel Cover | 150 | Ton | $100.00 | $15,000 | |
| Miscellaneous Equipment (including Heat Exchangers) | 1 | Lump sum | $5,000.00 | $5,000 | |
| Total Capital Cost over the 4 Month Project | | | | $44,000 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilization | 1 | Event | $30,000.00 | $30,000 | |
| Labor | 696 | Hr | $70.00 | $48,720 | |
| Per diem | 72 | Day | $175.00 | $12,600 | |
| Project Management | 104 | Hr | $100.00 | $10,440 | |
| Total Capital Cost over the 4 Month Project | | | | $101,760 | $0 |
| Total Capital Cost over the 4 Month Project | | | | $145,760 | $0 |
| Procurement costs (0%) | | | | $0 | $0 |
| Overhead (10%) | | | | $14,576 | $0 |
| Contingency (5%) | | | | $7,288 | $0 |
| Total Capital Cost over the 4 Month Project | | | | $21,864 | $0 |
| NET PRESENT WORTH | | | | | **$167,624** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Enhanced Bioremediation
## Estimated Costs

| | | |
|---|---|---|
| Site: | Media: | Soil beneath Garage |
| Garage (SS09) | Total volume: | 167 CY |
| | Project duration: | 33 Months (988 days) |
| | Discount rate: | 5% * |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (RD/RA) (Work plan, SAP, QAPjP, H&S) | 3 | Report | $5,000.00 | $15,000 | |
| Develop Specifications (30%, 95%, 100%) | 3 | Report | $5,000.00 | $15,000 | |
| Permitting (Air or Water) | 1 | Permit | $2,000.00 | $2,000 | |
| Treatability study | 1 | Study | $7,500.00 | $7,500 | |
| Nutrients | 67 | Lb | $1.00 | $67 | |
| Empty sand bags | 17 | Bag | $0.47 | $8 | |
| Hose | 1 | Hose | $50.00 | $50 | |
| Booms | 5 | Boom | $24.53 | $123 | |
| Trash pump | 2 | Month | $420.00 | $840 | |
| Personal H & S Expendibles | 90 | Day | $10.00 | $900 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $1,000.00 | $1,000 | |
| Total Capital Cost over the 33 Month Project | | | | $42,487 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilize/Demobilize | 1 | Event | $30,000.00 | $30,000 | |
| Transport Nutrients | | | | | |
| Transport Equipment | | | | | |
| Labor | 528 | Hr | $70.00 | $36,960 | |
| Per diem | 94 | Day | $175.00 | $16,450 | |
| Sampling & Analysis (initial) | 4 | Sample | $70.00 | $280 | |
| Sampling & Analysis (annual) | 2 | Event | $280.00 | | $560 |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 79 | Hr | $70.00 | $5,544 | |
| Closure (Month 33) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 33 Month Project | | | | $89,234 | $10,360 |
| Total Direct Cost over the 33 Month Project | | | | $131,721 | $10,360 |
| Procurement costs (5%) | | | | $6,586 | $518 |
| Overhead (10%) | | | | $13,172 | $1,036 |
| Contingency (10%) | | | | $13,172 | $1,036 |
| Total Administrative Cost over the 33 Month Project | | | | $32,930 | $2,590 |
| NET PRESENT WORTH | | | | | **$174,182** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Biosurfactants

## Estimated Costs

| Site: | Media: | Soil beneath Garage | |
|---|---|---|---|
| Garage (SS09) | Total volume: | 167 CY | |
| | Project duration: | 19 Months | (557 days) |
| | Discount rate: | 5% * | |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (RD/RA) (Work plan, SAP, QAPjP, H&S) | 3 | Report | $5,000.00 | $15,000 | |
| Develop Specifications (30%, 95%, 100%) | 3 | Report | $5,000.00 | $15,000 | |
| Permitting (Air & Water) | 2 | Permit | $2,000.00 | $4,000 | |
| Treatability study | 1 | Study | $7,500.00 | $7,500 | |
| Air Knife Purchase (pair) | 1 | Pair | $6,000.00 | $6,000 | |
| Compressor | 1 | Month | $2,000.00 | $2,000 | |
| Biosurfactants | 83 | Gal | $20.90 | $1,742 | |
| Nutrients | 67 | Lb | $1.00 | $67 | |
| Empty sand bags | 17 | Bag | $0.47 | $8 | |
| Hose | 500 | LF | $1.00 | $500 | |
| Booms | 6 | Boom | $24.53 | $147 | |
| Trash pump | 1 | Month | $420.00 | $420 | |
| Personal H & S Expendibles | 42 | Day | $10.00 | $420 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $1,000.00 | $1,000 | |
| Total Capital Cost over the 19 Month Project | | | | $53,804 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilization | 1 | Event | $30,000.00 | $30,000 | |
| Transport Biosurfactant | | | | | |
| Transport Nutrients | | | | | |
| Transport Equipment | | | | | |
| Labor | 384 | Hr | $70.00 | $26,880 | |
| Per diem | 46 | Day | $175.00 | $8,050 | |
| Sampling & Analysis (initial) | 4 | Sample | $70.00 | $280 | |
| Sampling & Analysis (final) | 1 | Event | $280.00 | | $280 |
| Travel for sampling | 2 | Trips | $1,200.00 | | $2,400 |
| Project Management | 58 | Hr | $70.00 | $4,032 | |
| Closure (Month 19) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 19 Month Project | | | | $69,242 | $7,680 |
| Total Direct Cost over the 19 Month Project | | | | $123,046 | $7,680 |
| Procurement costs (5%) | | | | $6,152 | $384 |
| Overhead (10%) | | | | $12,305 | $768 |
| Contingency (10%) | | | | $12,305 | $768 |
| Total Administrative Cost over the 19 Month Project | | | | $30,761 | $1,920 |
| NET PRESENT WORTH | | | | | **$161,604** |

* Estimated discount rate for calculating present value of future costs

# Alternative: Enhanced Bioremediation
## Estimated Costs

| | | |
|---|---|---|
| Site: | Media: | Area Under Garage/Gravel/Tundra |
| Combined Sites: SS01, ST02, SS03, SS05, and SS09 | Total volume: | 3,927 CY |
| | Project duration: | 33 Months (988 days) |
| | Discount rate: | 5% * |

| Description | Quantity | Units | Unit Cost | Fixed Cost | Annual Cost |
|---|---|---|---|---|---|
| CAPITAL COSTS: | | | | | |
| Planning Documents (RD/RA) (Work plan, SAP, QAPjP, H&S) | 3 | Report | $5,000.00 | $15,000 | |
| Develop Specifications (30%, 95%, 100%) | 3 | Report | $5,000.00 | $15,000 | |
| Permitting (Air or Water) | 1 | Permit | $2,000.00 | $2,000 | |
| Treatability study | 1 | Study | $7,500.00 | $7,500 | |
| Nutrients | 1,571 | Lb | $1.00 | $1,571 | |
| Empty sand bags | 47 | Bag | $0.47 | $22 | |
| Hose | 1 | Hose | $50.00 | $50 | |
| Booms | 5 | Boom | $24.53 | $123 | |
| Trash pump | 2 | Month | $420.00 | $840 | |
| Personal H & S Expendibles | 90 | Day | $10.00 | $900 | |
| Misc. Equipment and Supplies | 1 | Lump Sum | $1,000.00 | $1,000 | |
| Total Capital Cost over the 33 Month Project | | | | $44,005 | $0 |
| OPERATING COSTS: | | | | | |
| Mobilize/Demobilize | 1 | Event | $30,000.00 | $30,000 | |
| Transport Nutrients | | | | | |
| Transport Equipment | | | | | |
| Labor | 528 | Hr | $70.00 | $36,960 | |
| Per diem | 94 | Day | $175.00 | $16,450 | |
| Sampling & Analysis (initial) | 28 | Sample | $70.00 | $1,960 | |
| Sampling & Analysis (annual) | 2 | Event | $1,960.00 | | $3,920 |
| Travel for sampling | 4 | Trips | $1,200.00 | | $4,800 |
| Project Management | 79 | Hr | $70.00 | $5,544 | |
| Closure (Month 33) | 1 | Report | $5,000.00 | | $5,000 |
| Total Operating Cost over the 33 Month Project | | | | $90,914 | $13,720 |
| Total Direct Cost over the 33 Month Project | | | | $134,919 | $13,720 |
| Procurement costs (5%) | | | | $6,746 | $686 |
| Overhead (10%) | | | | $13,492 | $1,372 |
| Contingency (10%) | | | | $13,492 | $1,372 |
| Total Administrative Cost over the 33 Month Project | | | | $33,730 | $3,430 |
| NET PRESENT WORTH | | | | | **$181,994** |

* Estimated discount rate for calculating present value of future costs

## ATTACHMENT B
## ESTIMATED PROJECT DURATIONS

| | | |
|---|---|---|
| Gravel | • Presumptive Remedy for the POL Storage Area: Characterization Sampling and Offsite Disposal of Drums | 1 |
| | • No Action | 2 |
| | • Institutional Controls and Monitoring | 3 |
| | • Enhanced Bioremediation | 4 |
| | • Land Spreading | 5 |
| Tundra | • No Action | 6 |
| | • Institutional Controls and Monitoring | 7 |
| | • Enhanced Bioremediation | 8 |
| Soil Beneath Garage (SS09) | • No Action | 9 |
| | • Institutional Controls and Monitoring | 10 |
| | • Containment | 11 |
| | • Enhanced Bioremediation | 12 |
| | • Biosurfactants | 13 |
| Combined Media | • Enhanced Bioremediation | 14 |

# Presumptive Remedy for the POL Storage Area: Characterization and Off-Site Disposal of Drums Estimated Project Duration

Site:
POL Storage Area (SS04)

Start Date: Day 1
Medium: Tundra

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Planning Documents | 60 Days | Day 1 | Day 60 |
| Mobilization | 2 Days | Day 61 | Day 62 |
| Sampling and Drum Removal | 7 Days | Day 63 | Day 69 |
| Demobilization | 2 Days | Day 70 | Day 71 |
| Development of Closure Report | 30 Days | Day 72 | Day 101 |
| Closure | 0 Days | Day 101 | Day 101 |
| PROJECT DURATION | 101 Days | | |

## Alternative: No Action
## Estimated Project Duration

Sites:
Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), and Diesel Spills (SS05)

Start Date: Day 1
Medium: Gravel

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Closure Report | 30 Days | Day 1 | Day 30 |
| Closure | 0 Days | Day 30 | Day 30 |
| PROJECT DURATION | 30 Days | | |

## Alternative: Institutional Controls and Monitoring
## Estimated Project Duration

Sites:
Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), Diesel Spills (SS05)

Start Date: Day 1
Medium: Gravel

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Planning Documents | 60 Days | Day 1 | Day 60 |
| Implementation of Institutional Controls | 60 Days | Day 61 | Day 120 |
| Mobilization | 2 Days | Day 121 | Day 122 |
| Preliminary Sampling | 3 Days | Day 123 | Day 125 |
| Demobilization | 2 Days | Day 126 | Day 127 |
| End of First Year Sampling | 3 Days | Day 487 | Day 489 |
| End of Second Year Sampling | 3 Days | Day 849 | Day 851 |
| Development of Closure Report | 30 Days | Day 852 | Day 881 |
| Closure | 0 Days | Day 881 | Day 881 |
| PROJECT DURATION | 881 Days | | |

## Alternative: Enhanced Bioremediation
## Estimated Project Duration

Sites:
Sewage Disposal Area (SS01), Drum Storage Area (ST02), Beach Diesel Tanks (SS03), Diesel Spills (SS05)

Start Date: Day 1

Media: Gravel

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Treatability Study | 60 Days | Day 1 | Day 60 |
| Development of Planning Documents | 90 Days | Day 61 | Day 150 |
| Development of Specifications | 60 Days | Day 61 | Day 120 |
| Permits | 60 Days | Day 151 | Day 210 |
| Mobilization | 7 Days | Day 211 | Day 217 |
| Preliminary Sampling | 3 Days | Day 218 | Day 220 |
| Application of Nutrients and Water | 7 Days | Day 221 | Day 227 |
| Demobilization | 7 Days | Day 228 | Day 234 |
| End of First Year Sampling | 3 Days | Day 594 | Day 596 |
| End of Second Year Sampling | 3 Days | Day 956 | Day 958 |
| Development of Closure Report | 30 Days | Day 959 | Day 988 |
| Closure | 0 Days | Day 988 | Day 988 |
| PROJECT DURATION | 988 Days | | |

# Alternative: Land Spreading
# Estimated Duration

Sites:

Sewage Disposal Area (SS01), Drum
Storage Area (ST02), Beach Diesel
Tanks (SS03), Diesel Spills (SS05)

Start Date: Day 1
Media: Gravel

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Treatability Study | 60 Days | Day 1 | Day 60 |
| Development of Planning Documents | 90 Days | Day 61 | Day 150 |
| Development of Landspreading Plan | 60 Days | Day 61 | Day 120 |
| Solid Waste Disposal Permit | 60 Days | Day 61 | Day 120 |
| Mobilization | 7 Days | Day 121 | Day 127 |
| Preliminary Sampling | 3 Days | Day 128 | Day 130 |
| Landspreading and Application of Water | 21 Days | Day 131 | Day 151 |
| Demobilization | 7 Days | Day 152 | Day 158 |
| End of First Year Sampling and Reapplication of Water | 10 Days | Day 518 | Day 527 |
| End of Second Year Sampling | 3 Days | Day 887 | Day 889 |
| Development of Closure Report | 30 Days | Day 890 | Day 919 |
| Closure | 0 Days | Day 919 | Day 919 |
| PROJECT DURATION | 919 Days | | |

## Alternative: No Action
## Estimated Project Duration

Site:
Sewage Disposal Area (SS01) Start Date: Day 1
Diesel Spills (SS05) Medium: Tundra

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Closure Report | 30 Days | Day 1 | Day 30 |
| Closure | 0 Days | Day 30 | Day 30 |
| PROJECT DURATION | 30 Days | | |

## Alternative: Institutional Controls and Monitoring
## Estimated Project Duration

Site:
Sweage Disposal Area (SS01)
Diesel Spills (SS05)

Start Date: Day 1
Medium: Tundra

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Planning Documents | 60 Days | Day 1 | Day 60 |
| Implementation of Institutional Controls | 60 Days | Day 61 | Day 120 |
| Mobilization | 2 Days | Day 121 | Day 122 |
| Preliminary Sampling | 3 Days | Day 123 | Day 125 |
| Demobilization | 2 Days | Day 126 | Day 127 |
| End of First Year Sampling | 3 Days | Day 487 | Day 489 |
| End of Second Year Sampling | 3 Days | Day 849 | Day 851 |
| Development of Closure Report | 30 Days | Day 852 | Day 881 |
| Closure | 0 Days | Day 881 | Day 881 |
| PROJECT DURATION | 881 Days | | |

# Alternative: Enhanced Bioremediation
## Estimated Project Duration

Site:
Sewage Disposal Area (SS01) Start Date: Day 1
Diesel Spills (SS05) Media: Tundra

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Treatability Study | 60 Days | Day 1 | Day 60 |
| Development of Planning Documents | 90 Days | Day 61 | Day 150 |
| Development of Specifications | 60 Days | Day 61 | Day 120 |
| Permits | 60 Days | Day 151 | Day 210 |
| Mobilization | 7 Days | Day 211 | Day 217 |
| Preliminary Sampling | 3 Days | Day 218 | Day 220 |
| Application of Nutrients and Water | 7 Days | Day 221 | Day 227 |
| Demobilization | 7 Days | Day 228 | Day 234 |
| End of First Year Sampling | 3 Days | Day 594 | Day 596 |
| End of Second Year Sampling | 3 Days | Day 956 | Day 958 |
| Development of Closure Report | 30 Days | Day 959 | Day 988 |
| Closure | 0 Days | Day 988 | Day 988 |
| PROJECT DURATION | 988 Days | | |

## Alternative: No Action
## Estimated Project Duration

Site:
Garage (SS09)

Start Date: Day 1
Medium: Soil beneath Garage

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Closure Report | 30 Days | Day 1 | Day 30 |
| Closure | 0 Days | Day 30 | Day 30 |
| PROJECT DURATION | 30 Days | | |

## Alternative: Institutional Controls and Monitoring
## Estimated Project Duration

Site:
Garage (SS09)

Start Date: Day 1
Medium: Soil beneath Garage

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Planning Documents | 60 Days | Day 1 | Day 60 |
| Implementation of Institutional Controls | 60 Days | Day 61 | Day 120 |
| Mobilization | 2 Days | Day 121 | Day 122 |
| Preliminary Sampling | 3 Days | Day 123 | Day 125 |
| Demobilization | 2 Days | Day 126 | Day 127 |
| End of First Year Sampling | 3 Days | Day 487 | Day 489 |
| End of Second Year Sampling | 3 Days | Day 849 | Day 851 |
| Development of Closure Report | 30 Days | Day 852 | Day 881 |
| Closure | 0 Days | Day 881 | Day 881 |
| PROJECT DURATION | 881 Days | | |

## Alternative: Containment

## Estimated Project Duration

Sites:
Garage (SS09)

Start Date: Day 1
Medium: Soil beneath Garage

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Development of Planning Documents | 90 Days | Day 1 | Day 90 |
| Mobilization | 7 Days | Day 91 | Day 97 |
| Installation of Containment | 15 Days | Day 98 | Day 112 |
| Demobilization | 7 Days | Day 113 | Day 119 |
| PROJECT DURATION | 119 Days | | |

# Alternative: Enhanced Bioremediation
## Estimated Project Duration

Site:
Garage (SS09)

Start Date: Day 1
Media: Soil beneath Garage

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Treatability Study | 60 Days | Day 1 | Day 60 |
| Development of Planning Documents | 90 Days | Day 61 | Day 150 |
| Development of Specifications | 60 Days | Day 61 | Day 120 |
| Permits | 60 Days | Day 151 | Day 210 |
| Mobilization | 7 Days | Day 211 | Day 217 |
| Preliminary Sampling | 3 Days | Day 218 | Day 220 |
| Application of Nutrients and Water | 7 Days | Day 221 | Day 227 |
| Demobilization | 7 Days | Day 228 | Day 234 |
| End of First Year Sampling | 3 Days | Day 594 | Day 596 |
| End of Second Year Sampling | 3 Days | Day 956 | Day 958 |
| Development of Closure Report | 30 Days | Day 959 | Day 988 |
| Closure | 0 Days | Day 988 | Day 988 |
| PROJECT DURATION | 988 Days | | |

## Alternative: Biosurfactants
## Estimated Project Duration

Site:
Garage (SS09)

Start Date: Day 1
Media: Soil beneath Garage

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Treatability Study | 90 Days | Day 1 | Day 90 |
| Development of Planning Documents | 60 Days | Day 91 | Day 150 |
| Development of Specifications | 60 Days | Day 91 | Day 150 |
| Permits | 60 Days | Day 91 | Day 150 |
| Mobilization | 7 Days | Day 151 | Day 157 |
| Preliminary Sampling | 3 Days | Day 158 | Day 160 |
| Application of Biosurfactant to soil and Requisite Nutrients to Tank of Collected Water | 7 Days | Day 161 | Day 167 |
| Sampling of Collected Water | 1 Days | Day 527 | Day 527 |
| Demobilization | 3 Days | Day 528 | Day 530 |
| Development of Closure Report | 30 Days | Day 528 | Day 557 |
| Closure | 0 Days | Day 557 | Day 557 |
| PROJECT DURATION | 557 Days | | |

## Alternative: Enhanced Bioremediation
## Estimated Project Duration

Site:
Combined Sites: SS01,ST02, SS03,SS05,SS09

Start Date: Day 1
Media: Area Under Garage/Gravel/Tundra

| Activity | Duration | Start Date | End Date |
|---|---|---|---|
| Treatability Study | 60 Days | Day 1 | Day 60 |
| Development of Planning Documents | 90 Days | Day 61 | Day 150 |
| Development of Specifications | 60 Days | Day 61 | Day 120 |
| Permits | 60 Days | Day 151 | Day 210 |
| Mobilization | 7 Days | Day 211 | Day 217 |
| Preliminary Sampling | 3 Days | Day 218 | Day 220 |
| Application of Nutrients and Water | 7 Days | Day 221 | Day 227 |
| Demobilization | 7 Days | Day 228 | Day 234 |
| End of First Year Sampling | 3 Days | Day 594 | Day 596 |
| End of Second Year Sampling | 3 Days | Day 956 | Day 958 |
| Development of Closure Report | 30 Days | Day 959 | Day 988 |
| Closure | 0 Days | Day 988 | Day 988 |
| PROJECT DURATION | 988 Days | | |

# APPENDIX A

# REFERENCES AND LIST OF ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASUREMENT

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## LIST OF ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASUREMENT

| | |
|---|---|
| ADEC | Alaska Department of Environmental Conservation |
| AFCEE | Air Force Center for Environmental Excellence |
| Air Force | United States Air Force |
| AMSL | Above Mean Sea Level |
| ARARs | Applicable or Relevant and Appropriate Requirements |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylene |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| COC | Chemical of Concern |
| CT&E | Commercial Testing and Engineering, Inc. |
| DEQPPM | Defense Environmental Quality Program Policy Memorandum |
| DOD | Department of Defense |
| DRO | Diesel Range Organics |
| DRPH | Diesel Range Petroleum Hydrocarbons |
| EPA | U.S. Environmental Protection Agency |
| ERA | Ecological Risk Assessment |
| F&B | Friedman & Bruya, Inc. |
| FS | Feasibility Study |
| FWPCA | Federal Water Pollution Control Act |
| GC | Gas Chromatograph |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| GRA | General Response Action |
| GRO | Gasoline Range Organics |
| GRPH | Gasoline Range Petroleum Hydrocarbons |
| HQ | Hazard Quotient |
| HVOC | Halogenated Volatile Organic Compound |
| ICP | Inductively Coupled Plasma |
| IRP | Installation Restoration Program |
| LRR | Long Range Radar |
| MCL | Maximum Contaminant Levels |
| NCP | National Contingency Plan |
| NPL | National Priority List |
| QA | Quality Assurance |
| QAPjP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| QC | Quality Control |
| PCB | Polychlorinated Biphenyl |
| POL | Petroleum, Oils, and Lubricants |

## LIST OF ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASUREMENT (CONTINUED)

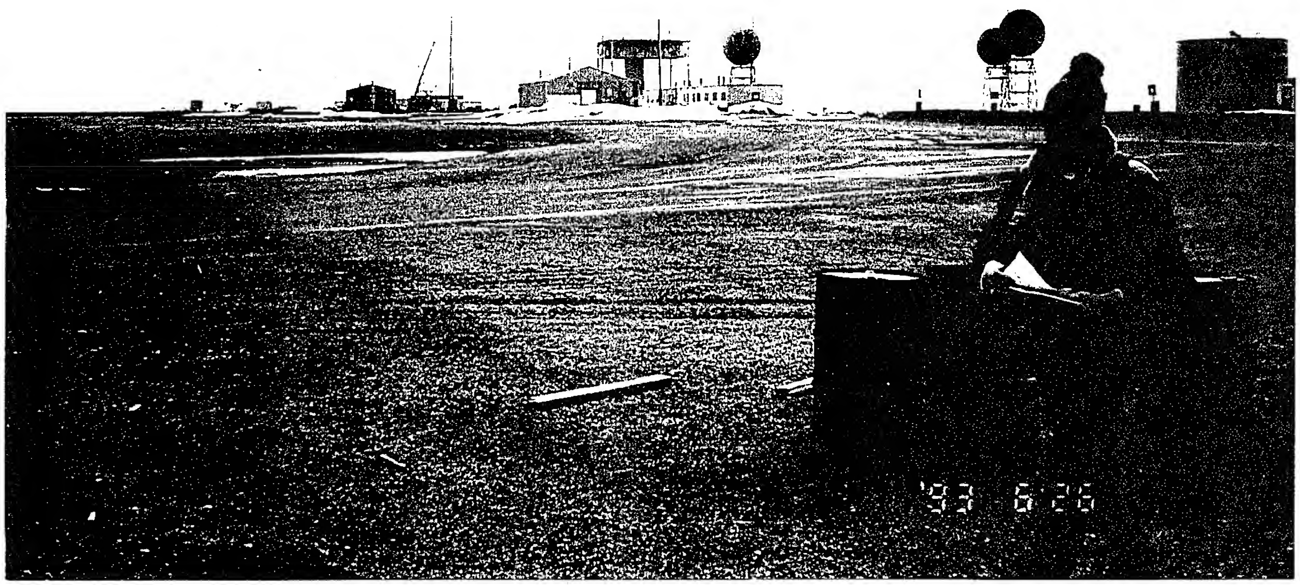
| | |
|---|---|
| RAGS | Risk Assessment Guidance for Superfund |
| RBSL | Risk-Based Screening Levels |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| RRPH | Residual Range Petroleum Hydrocarbon |
| SAP | Sampling and Analysis Plan |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| SOPs | Standard Operating Procedures |
| SRR | Short Range Radar |
| SVOC | Semi-Volatile Organic Compound |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TDS | Total Dissolved Solids |
| TOC | Total Organic Carbon |
| TRV | Toxicity Reference Values |
| TSS | Total Suspended Solids |
| UCL | Upper Confidence Limit |
| VOC | Volatile Organic Compound |

## MEASUREMENTS

| | |
|---|---|
| µg/L | micrograms per liter |
| mg/kg | milligrams per kilogram |
| ppm | parts per million |

# APPENDIX B

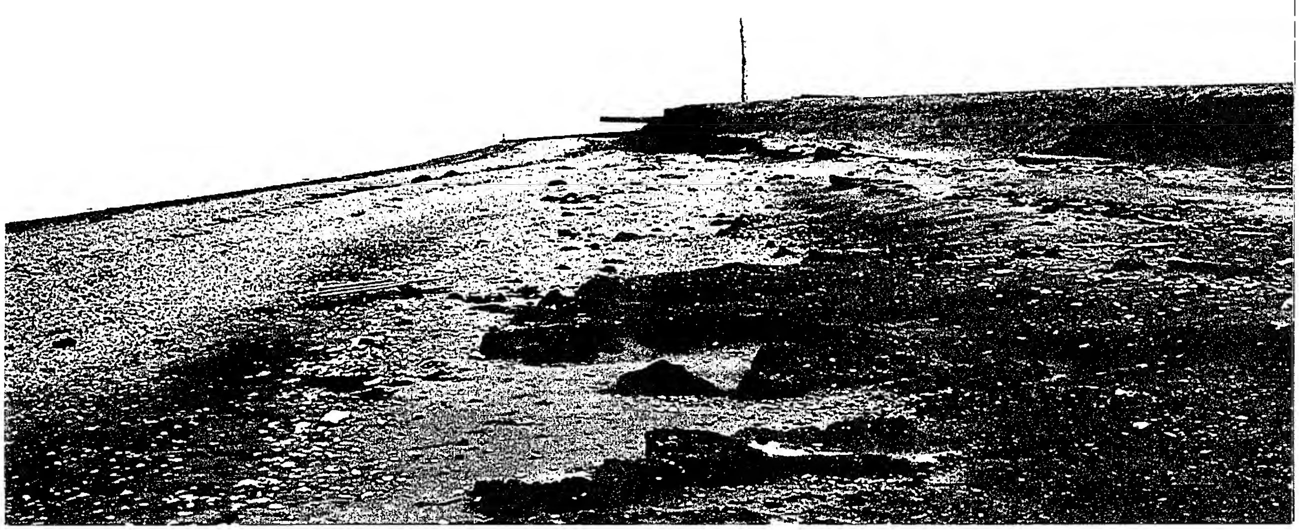
# PHOTOGRAPHS OF THE POINT LONELY RADAR INSTALLATION AND SITES




A view to the southeast of the Point Lonely radar installation in June.

A view to the southeast of the Point Lonely radar installation from the Sewage Disposal Area (SS01) site. The Beach Diesel Tanks (SS03) site is shown in the foreground.


Two inactive fuel fill pipes extend onto the beach at the Sewage Disposal Area (SS01) site. This view of the eastern most diesel fuel fill pipe is to the west along the beach at the site.



A view to the northeast of the Sewage Disposal Area (SS01) site.

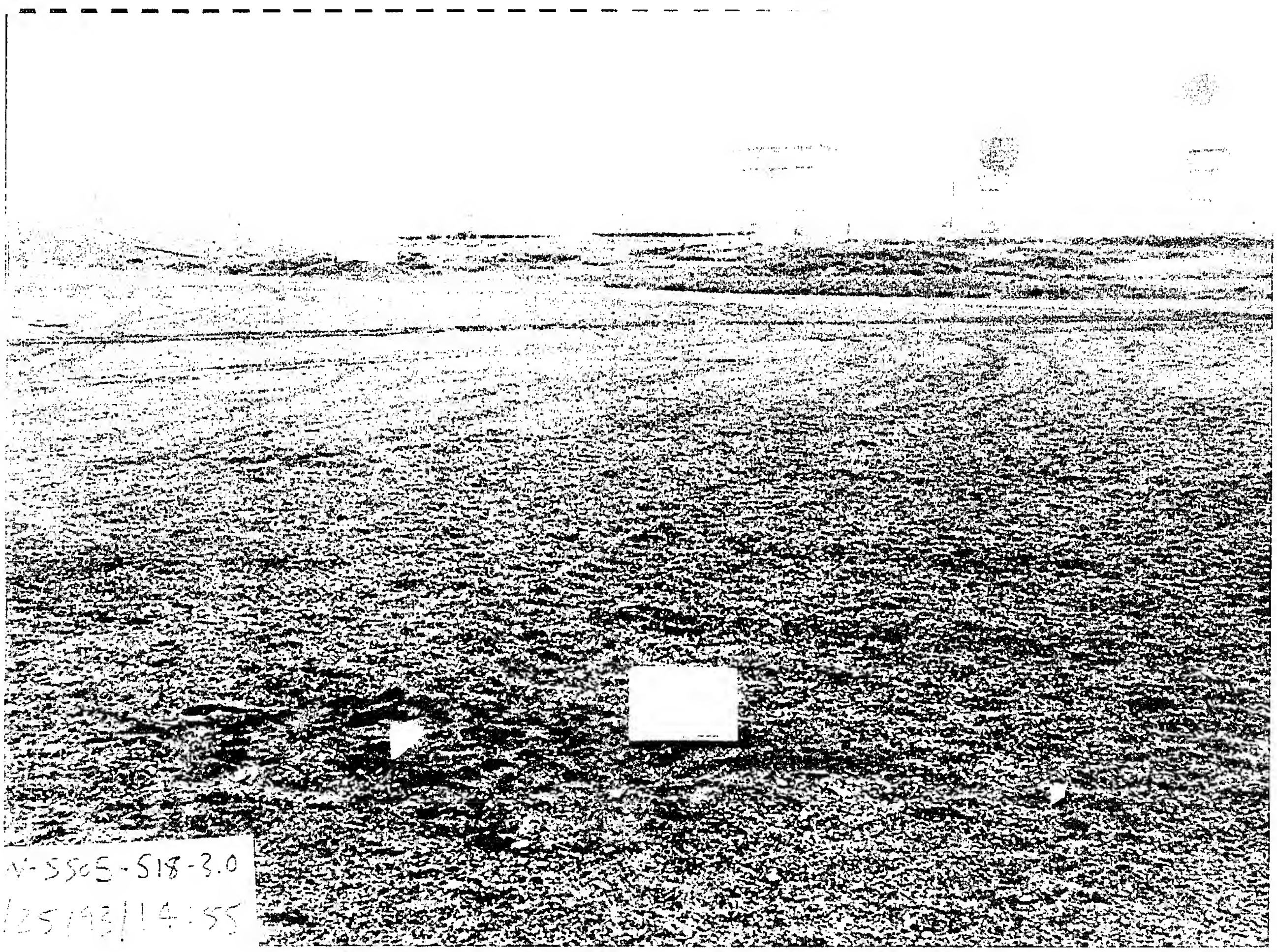
This view to the northeast of the Sewage Disposal Area (SS01) site shows both the east diesel fill pipe (lower pipe) to the Beach Diesel Tanks and a culvert (above pipe). The inactive sewage outfall pipes are located just below the culvert.

A view to the northwest of the Drum Storage Area (ST02) site. Drums are no longer stored at this site; however, a stained area of limited extent is apparent on the gravel pad. The Beach Diesel Tanks (SS03) are located in the background to the left.

A view to the north of the inactive Beach Diesel Tanks (SS03) site. When the tanks were inactivated the lined berm was breached.

One 10,000-gallon jet fuel tank and several 55-gallon drums of POL products were stored at the POL Storage (SS04) site gravel pad during 1993 construction activities. This view is to the east.

This is a view to the north of the Diesel Spills (SS05) site. The tanks previously belonged to the Husky Oil Company.

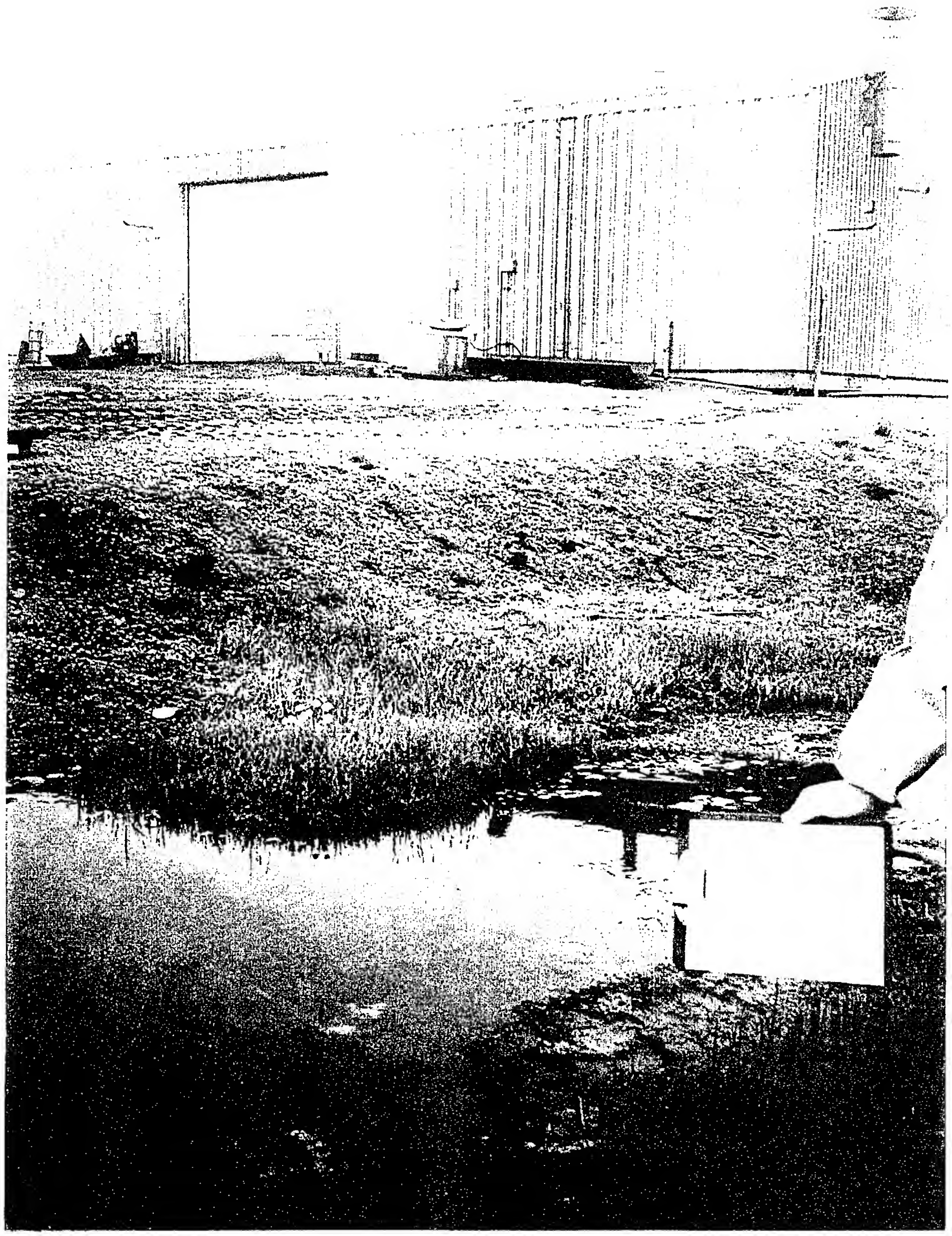



This is a view to the east of the gravel pad adjacent to the Diesel Spills site. One of the installation's diesel tanks can be seen to the left in this photo.

Stressed vegetation was observed south of the gravel pad at the Diesel Spills site. This is a view to the south.

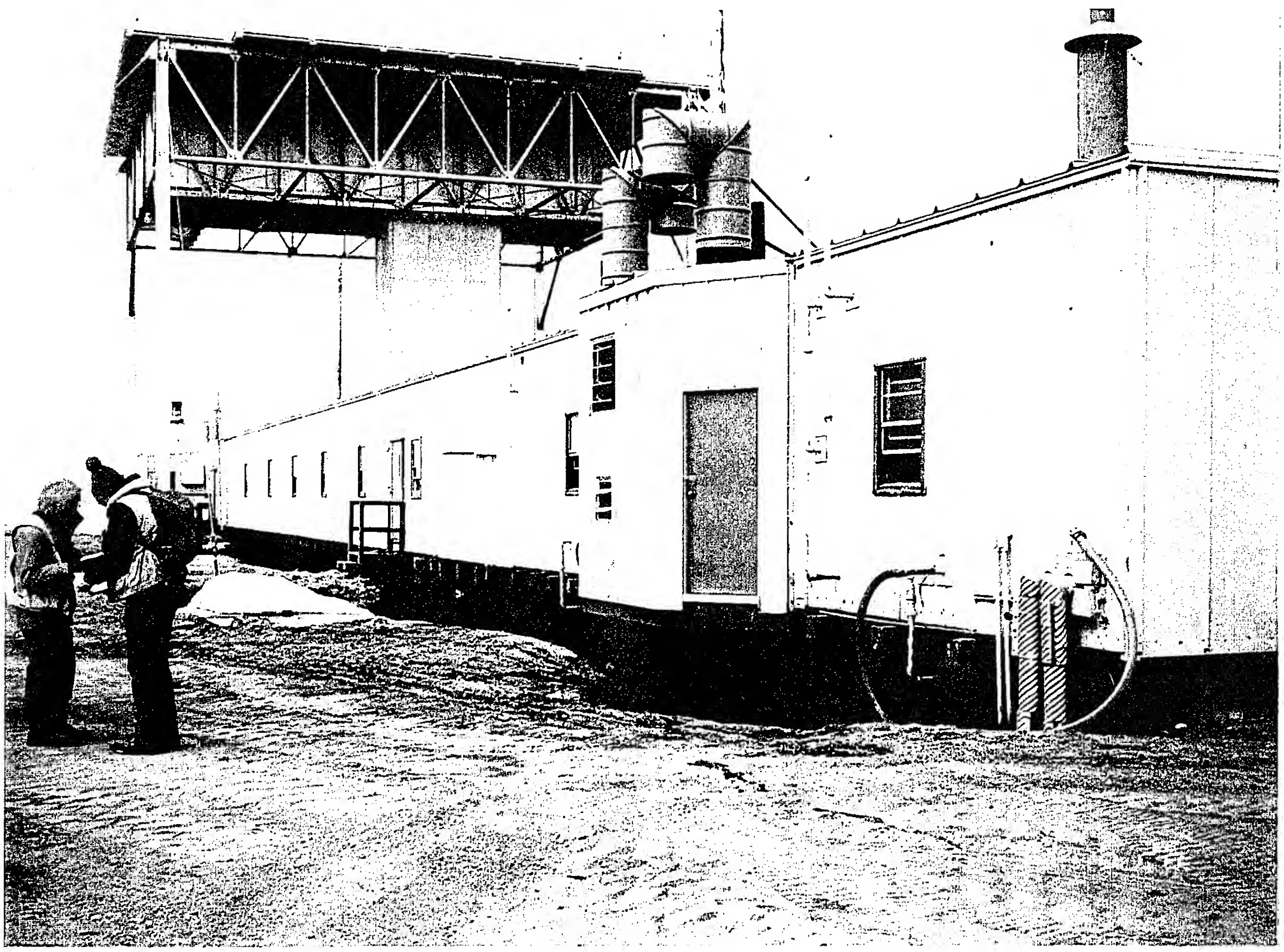
A view to the southeast of the Old Dump Site (LF07) at Point Lonely. This landfill was active from approximately 1955 to 1976.

The Garage (SS09) site at Point Lonely is located northwest of the module train.
This is a view of the Garage to the southeast.



A view to the south of the Garage (SS09) site.

The Inactive Landfill (LF11) site was sampled in conjunction with the adjacent Vehicle Storage Area (SS14) located to the north. This view is to the northeast.



This is a view to the northeast of the Module Train (SS12) site.

This is a view to the south at the Hangar Pad Area (SS13). The hangar is in the background.

# APPENDIX C

# COPY OF THE TASK DESCRIPTIONS AND STATEMENT OF WORK

RSF 66X

66X

## ORDER FOR SUPPLIES OR SERVICES

1. PAGE 1 OF 3

2. PROC INSTRUMENT ID NUMBER (PIN): F33615-90-D-4010
MARK ALL PACKAGES AND PAPERS WITH THIS NUMBER

3. CALL/ORDER NUMBER: 0022

4. DATE OF ORDER*: 8 APR 1993

5. REQUISITION/PURCHASE REQUEST PROJECT NUMBER: FY7624-93-08202

6. CERTIFIED FOR NATIONAL DEFENSE UNDER DO-C9 BDC REG 2/DMS REG 1 RATING

7. ISSUED BY CODE FQ2826

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIEL COMMAND
HUMAN SYSTEMS CENTER/PK
8005 9TH STREET
BROOKS AFB TX 78235-5353
BUYER: EDWIN CUSTODIO/HSC-PKVBA
PHONE: (210) 536-4493

8. ADMINISTERED BY CODE S2101A

DCASMA BALTIMORE
200 TOWSONTOWN BLVD, WEST
TOWSON MD 21204-5299

9. CONTRACTOR NAME AND ADDRESS CODE 69148 FACILITY CODE

ICF TECHNOLOGY, INC
9300 LEE HIGHWAY
FAIRFAX VA 22031-1207

PHONE: (703) 934-3000
COUNTY: FAIRFAX

F "S" FOR MULTIPLE FACILITIES SEE SECT "G"

10. MAIL INVOICES TO: U

11. DISCOUNT FOR PROMPT PAYMENT

1 ST N % ___ DAYS
2 ND ___ % ___ DAYS
3 RD ___ % ___ DAYS
NET DAYS ___ OTHER F "S" SEE SECT "G"

12A. PURCHASE OFFICE POINT OF CONTACT: MVH/M6V/MVY

12B. RESERVED FOR SERVICE/AGENCY USE

13. PAYMENT WILL BE MADE BY CODE S3910A F "S" SEE SECT "G"

DCASR, PHILADELPHIA
P.O. BOX 7730
PHILADELPHIA, PA 19101-7478

14. TYPE CONTRACTOR: A

15. SECURITY A. CLASSIFICATION: U B. DATE OF DD 254

16. CONTRACT ADMINISTRATION

| A. FAST PAY | B. CONTRACT (1) KIND | (2) TYPE | C. ABSTRACT RECIP ADP POINT | D. SPL CONT PROVISIONS | E. CONT ADMIN FUND LMT | 17. (RESERVED) | 18. SVC/AGENCY USE | 19. SURV. CRIT | 20. TOTAL AMOUNT |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | Y | | | | | | C | NOT-TO-EXCEED $299,855.00 |

21. APPROPRIATION AND ACCOUNTING DATA

A. ACTY CLAS: U  B. ACRN: AA  C. APPROPRIATION: 5733400  D. LIMIT SUBHEAD

E. SUPPLEMENTAL ACCOUNTING CLASSIFICATION: 303 7434 434419 00007 53440 78008F 674400

F. CPN RECIPIENT DODAAD: F74400  G. OBLIGATION AMOUNT: $299,855.00

H. NON-CURRENT PAYMENT/PROJ  I. SVC AGENCY USE: FY7624-93-08202

22A. TYPE OF ORDER: DELIVERY X / PURCHASE

B. NON-DOD CONTRACT NUMBER

This delivery order is subject to instructions contained on this side of form only and is issued in accordance with and subject to terms and conditions of above numbered contract, or Non-DOD Contract Number.

Reference your ______

Furnish the following on terms specified herein.

If quantity accepted by the Government is same as quantity ordered, indicate by mark. If different enter actual quantity accepted below quantity ordered and encircle.

23. UNITED STATES OF AMERICA
GARY J. MACDECY Gary J. Macdecy 93APR08
BY: NAME OF CONTRACTING/ORDERING OFFICER AND DATE (YYMMDD)

24. TOTAL

25. DIFFERENCES

25. QUANTITY ORDERED HAS BEEN
☐ INSPECTED ☐ RECEIVED ☐ ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS STATED

DATE SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

26. SHIP NUMBER
☐ PARTIAL
☐ FINAL

27. D.O. VOUCHER NUMBER

28. INITIALS

29. PAYMENT
☐ COMPLETE
☐ PARTIAL
☐ FINAL

31. PAID BY

32. AMOUNT VERIFIED CORRECT FOR

33. CHECK NUMBER

34. BILL OF LADING NUMBER

36. I CERTIFY THIS AMOUNT IS CORRECT AND PROPER FOR PAYMENT

SIGNATURE AND TITLE OF CERTIFYING OFFICER

| RECEIVED AT | 37. RECEIVED BY | 38. DATE RECEIVED | 39. TOTAL CONTAINERS | 40. S/R ACCOUNT NUMBER | 41. S/R VOUCHER NUMBER |
|---|---|---|---|---|---|
| | | | | | |

AFSC Form 700, DEC 88 PREVIOUS EDITION IS OBSOLETE

*When used as a formal contract this will be the effective date.

REFERENCE AF FORM 616 H93SR232 (Change #1), DATED: 23 MAR 93

1. In accordance with the provisions of the Basic Contract F33615-90-D-4010 and this Delivery Order 0022, the contractor shall accomplish the effort described in the Statement of Work (SOW) dated 16 MAR 93 attached hereto at a total ceiling price of $299,855.00.

2. As a result of paragraph 1 above, the subject order is more specifically modified as set forth below:

SECTION B - THE SCHEDULE:

| Item No | Supplies/Services | Quantity Purch Unit | Unit Price Total Item Amt |
|---|---|---|---|
| 0001 | CLIN sec class: U | 1 LO | N N |
| | noun: SAMPLING, ANALYSIS AND DATA<br>acrn: AA nsn: N<br>site codes pqa: D acp: D fob: D<br>pr/mipr data: FY7624-93-08202<br>type contract: Y | | |
| | descriptive data:<br>Conduct work in accordance with the Statement of Work (SOW) of this order, dated 16 MAR 93 and Section C, The Description/Specifications of the Basic contract. Submit data in accordance with Attachment #1, the Contract Data Requirements List (CDRL) of the basic contract as implemented by paragraph VI of this order's SOW dated 16 MAR 93. | | |
| 0002 | CLIN sec class: U | 1 LO | N N |
| | noun: SUPPORT<br>acrn: AA nsn: N<br>site codes pqa: D acp: D fob: D<br>pr/mipr data: FY7624-93-08202<br>type contract: Y | | |
| | descriptive data:<br>Provide support in accordance with the Statement of Work (SOW) of this order, dated 16 MAR 93 and Section C, The Description/Specification of the basic contract. | | |

3. SECTION C - Description/Specification: - See attached Statement of Work entitled "Installation Restoration Program/Remedial Investigation/Feasibility Study for Distant Early Warning (DEW) line Sites, AK (Barter Island AFS (BAR-M), Bullen Point AFS (POW-3), Point Lonely AFS (POW-1), Point Barrow AFS (POW-M), Point Lay AFS (LIZ-2), Wainwright AFS (LIZ-3), and Oliktok Point AFS (POW-2)" dated 16 MAR 93.

4. SECTION F - Schedule Data:

| Item No | Supplies Schedule Data | | Delivery Quantity | Schedule Date |
|---|---|---|---|---|
| 0001 | CLIN Del Sch<br>acrn: AA<br>ship to: U | sec class: U | 1 | 93DEC31 |
| | descriptive data:<br>Technical effort shall be completed in accordance with the Statement of Work (SOW) dated 16 MAR 93. All data shall be delivered in accordance with Attachment #1 of the basic contract as implemented by paragraph VI of the Statement of Work dated 16 MAR 93. The data shall be accepted by the Government not later than 31 DEC 93. | | | |
| 0002 | CLIN Del Sch<br>acrn: AA<br>ship to: U | sec class: U | 1 | 93DEC31 |
| | descriptive data:<br>Technical effort shall be completed in accordance with the Contract Data Requirements List (Attachment #1) of the basic contract as implemented by paragraph VI of the Statement of Work. | | | |

1993 March 16

**STATEMENT OF WORK**
**INSTALLATION RESTORATION PROGRAM**
**REMEDIAL INVESTIGATION/FEASIBILITY STUDY**

**STAGE 1**

**DISTANT EARLY WARNING (DEW) LINE SITES and CAPE LISBURNE AFS, AK**

## I. DESCRIPTION OF WORK

### 1.1 Scope

1.1.1 **Background.** The objective of the Air Force Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan (NCP) for those sites which pose a threat to human health and welfare or the environment. This objective is achieved through a Remedial Investigation Feasibility Study (RI/FS) process in which conclusions and recommendations drawn from accurate and validated data are used to structure and guide subsequent activities.

The RI/FS process includes scoping to define data requirements and objectives, a remedial investigation to characterize sites for a baseline risk assessment, and a feasibility study to define and evaluate alternative remedial actions so that a recommended action may be selected. Each of these steps of the RI/FS process can be conducted in stages that focus on particular aspects of the process.

The contractor shall accomplish the actions described in this Statement of Work (SOW) to complete the RI/FS process at the following seven Dew Line Sites and Cape Lisburne:

Barter Island AFS (BAR-M); Bullen Point AFS (POW-3); Point Lonely AFS (POW-1); Point Barrow AFS (POW-M); Point Lay AFS (LIZ-2); Wainwright AFS (LIZ-3); and Oliktok Point AFS (POW-2).

1.1.2 **Requirements for Project Activities.** The Installation Restoration Program (IRP) Handbook referenced in this Statement of Work provides requirements for laboratory and field activities and applicable formats for project documents that shall be used by the contractor. Volume 1 of the Handbook dated May 1992 is provided under separate cover. This document is referenced in this Statement of Work as the Handbook. The contractor is responsible for the thorough knowledge and understanding of the previous findings and recommendations that affect this task prior to the start of field activities. The documents involved include but are not limited to the IRP Phase I Records Search, and the IRP Phase II plans and reports addressing the Dew Line Sites and Cape Lisburne.

1.1.3 **Meetings.** A maximum of two (2) contractor personnel, including the project leader, shall attend four (4) meetings at Elmendorf AFB, AK. Each meeting shall be two (2) 8-hour workdays in duration. All meetings shall be coordinated by the TPM.

1.1.4 **Special Notifications.** The contractor shall immediately report to the TPM, or designate, via telephone, any data or results generated during this investigation which may indicate an imminent health risk. Following this telephone notification, a written notice shall be prepared and

delivered within three (3) days. This notification shall include supporting documentation (sequence 16, para 6.1)

1.2 Project Scoping Documents

The purpose of the project scoping documents is to clearly and comprehensively define project activities prior to the initiation of field work. The contractor shall prepare and submit the following project scoping documents for this task prior to the initiation of any field activities or laboratory analyses.

1.2.1 **Engineering Network Analysis.** Provide within ten (10) days after the issuance of an order a computer generated network analysis which is a detailed task plan for the RI/FS work efforts. The network analysis (GANTT) chart shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period of the delivery order. The network analysis (GANTT) shall show both serial and parallel subtasks leading to a deliverable product or report, and shall show early and late start and completion dates with float. The network analysis (GANTT) shall be updated and submitted quarterly (sequence 3, para 6.1).

1.2.2 **Work Plan.** This section will discuss the overall approach, (including a brief summary of the Conceptual Site Model and Data Quality Objectives), major tasks, scope, timeline, and major decision points. Due to the extreme remoteness of the Dew Line Sites and Cape Lisburne, the contractor shall include a detailed plan for logistics and strategy to complete the RI/FS field activities. Follow the format specified in section 1 of the Handbook. In preparing the Work Plan, use previous reports and the information gathered during the literature search and presurvey along with experience at similar sites. Reevaluate the recommendations for Dew Line Sites and Cape Lisburne developed during previous IRP stages (sequence 4, para 6.1).

1.2.3 **Sampling and Analysis Plan (SAP).** The SAP consists of a quality assurance plan (QAPP) and a Field Sampling Plan (FSP). Prepare a SAP describing how project activities will be accomplished in the format specified in section 1 of the Handbook. Incorporate review comments and obtain TPM concurrence prior to the start of field activities (sequence 4, para 6.1).

1.2.4 **Health and Safety Plan (HSP).** Provide a written Health and Safety Plan within eight (8) weeks after the issuance of an order. The contractor shall comply with USAF, OSHA, EPA, state, and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for designating the appropriate levels of protection needed at the study sites. The Health and Safety Plan shall provide no less protection than the protection contained in the manual entitled 'Health and Safety Requirements for Employees Engaged in Field Activities' dated 1981 and the 'Occupational Safety and Health Manual for Hazardous Waste Sites Activities' dated 1985 and 29 CFR 1910. Coordinate the Health and Safety Plan directly with applicable regulatory agencies prior to submittal to AFCEE/ESR. The contractor shall certify to AFCEE/ESR that the contractor has reviewed the coordinated Health and Safety Plan with each employee and also subcontractor's employees prior to the time each employee engages in field activities (sequence 4, para 6.1).

1.2.5 **Community Relations Plan.** The contractor shall prepare a Community Relations Plan (CRP) for the DEW Line Sites and Cape Lisburne AFS outlining the specific public communications and involvement techniques to be used in coordination with remedial site activities (sequence 4, para 6.1). Follow the guidance contained in 'Community Relations in Superfund, a Handbook', office of Solid Waste and Emergency Response (OSWER) Directive

9230.0-03C (EPA/540/R-92/009, January 1992. PB92-963341), and other applicable directives. Also, use as a guidance previously accomplished CRP from other installations in Alaska. Appropriately adapt such guidance to the local situation at the DEW Line Sites and Cape Lisburne. As described in OSWER Directive 9230.0-03C, the CRP shall include, but not be limited to, a description of the sites and the community, an overview of the community involvement to date, key community concerns regarding the site and AF site activities, and suggested community relations activities. A contact list of elected officials, agency representatives, and interested groups and individuals shall be included in appropriate copies of the plan. In addition, the plan will include suggested locations for meetings and information repositories. Contractor activities to develop the CRP shall include conducting a review of site information provided by the AF.

1.3 Project Activities

The contractor shall conduct the following tasks to achieve the purposes stated herein, in compliance with approved scoping documents, the Handbook, and all applicable regulations and requirements.

1.3.1 Community Relations. Provide support to the base public affairs office for the tasks described below pertaining to the RI/FS Community Relations Program.

1.3.1.1 Public meetings and workshops. The contractor shall be responsible for coordinating public meetings and workshops for all DEW Line Sites and Cape Lisburne AFS. This includes producing briefing scripts, slides and any associated products such as response cards and sign-in sheets. As requested by the base Community Relations office in coordination with the TPM, research and provide materials for public queries, news media queries, and news releases. Assume a maximum of one (1) workshop/meeting (Seq. nos. 3,9).

1.3.1.2 Public notices. As required by the base Community Relations office and the TPM, the contractor shall prepare and publish public notices for the Fairbanks and local newspapers. The purpose of these notices is to inform the public of a meeting, workshop, or comment period in which they have the opportunity to be involved in the IRP Program at DEW Line Sites and Cape Lisburne AFS. Also, these notices may be utilized to inform the public of other pertinent program information such as quarterly notices of documents placed in the information repositories. The format for the notices shall be coordinated with the Community Relations office and TPM, and then submitted to the TPM for review prior to delivery to the base. Assume a maximum of two (2) notices (Seq. no. 3).

1.3.1.3 Photo Notebook The contractor shall develop a photo notebook which focuses on the overall IRP program at DEW Line Sites and Cape Lisburne AFS. The layout of the notebook will be coordinated with the public affairs office and TPM. Assume a maximum of one (1) update (Seq. no. 9).

1.3.1.4 Mailing List. In coordination with the base Community Relations office and the TPM, prepare and update the mailing list on a quarterly basis. Assume a maximum of two (2) updates (Seq. no. 3).

1.3.1.5 Maps. Prepare presentation quality maps of the installations and their sites to use in newsletters and to distribute to the public.

1.3.2 Literature Search. Conduct a literature search and analyze aerial photos of the DEW Line Sties to supplement existing information that has been collected. The purpose of the literature search is to complete the

conceptual site model so that a numerical estimate of risk can be developed.

1.3.3 **Presurvey.** Within eight weeks of the issuance of an order, the contractor shall visit the Dew Line Sites and Cape Lisburne to ensure complete understanding of site conditions. Coordinate this visit with the TPM and the 11 CEOS project manager. The contractor shall look for evidence of contamination at each site visited (e.g., leaking drums, vegetative stress, leachate seeps). The contractor shall observe the physical settings of each site visited to formulate specific recommendations concerning boring placement, use of geophysical techniques, and other aspects of the proposed field investigation. The findings of the presurvey shall be used to prepare the Work Plan, SAP, and HSP for the RI and to prepare scoping documents for the treatability study(ies). Assume one presurvey and one reconnaissance trips.

1.3.4 **Quality Assurance/Quality Control (QA/QC).** A QA/QC program shall be conducted and documented for all work pursuant to this delivery order. Contractor and project-specific documents concerning QA/QC procedures and requirements shall be strictly followed. Data generated under the QA/QC program shall be used by the contractor for evaluating the analytical results and field records assembled for each site to identify accurate and validated data that may be used to assess risk, develop conceptual site models and evaluate alternatives.

1.3.5 **Conceptual Site Model.** Use all available RI/FS data supported by acceptable QA/QC results (as measured against QAPP requirements) and site characterization information to refine, based on newly collected data, the conceptual site model. The model shall define the nature and extent of contamination and the transport and fate of those contaminants. The minimum requirements of the model are given in section 2 of the Handbook. The complexity and detail of the site model shall be consistent with the nature of the site and site problems, and the amount of data available the conceptual site model shall be documented in the Work Plan.

1.3.6 **ARARs Evaluation.** The contractor shall identify all Applicable or Relevant and Appropriate Requirements (ARAR). These ARARs will be documented in the Work Plan.

## 1.4 Project Deliverables

Deliver the following documents in compliance with the requirements of item VI, the formats required in section 1 and 4 of the Handbook, and the specifications noted below. Draft reports are considered 'drafts' only because they have not been reviewed and approved by the Air Force. In all other respects, 'drafts' shall be complete, in the proper format, fully illustrated, and free of grammatical and typographical errors.

### 1.4.1 Scoping Documents.

a. Engineering Network Analysis (GANTT) (para 1.2.1). Provide within ten (10) days after the issuance of an order. Update and submit quarterly (sequence 3, para 6.1).

b. Work Plan (para 1.2.2). Use the format in section 1 of the Handbook (sequence 4, para 6.1).

c. Sampling and Analysis Plan (1.2.3). Use the format in section 1 of the Handbook (sequence 4, para 6.1).

d. Health and Safety Plan (para 1.2.4). Provide within six (6) weeks after the issuance of an order (sequence 4, para 6.1).

e. Community Relations Plan (para 1.2.5). Provide within eight (8) weeks after issuance of an order (sequence 4, para 6.1).

1.4.2 Special Notification. Provide written notification of imminent health hazards and supporting documentation within three (3) days of telephone notification (sequence 15, para 6.1).

1.4.3 Presentation Materials. The contractor shall prepare and present up to two (2) presentation packages at meetings coordinated by the Air Force (sequence 9, para 6.1). Attendance of these meetings is included in paragraph 1.1.3 of this SOW. As part of the presentation materials, the contractor shall provide paper copies of all slides and overheads.

1.4.4 Meeting summaries (para 1.1.3). Provide no later than five (5) days after conclusion of each meeting (sequence 18, para 6.1).

1.4.5 Newsletter. Prepare and submit a quarterly newsletter which presents the status of the entire base IRP Program. This will include preparing an outline resulting from input by all contractors involved in the program. The outline must be approved by the base and TPM prior to submittal of the newsletter. The final product will be printed and distributed as agreed to by the TPM. Assume a maximum of two (2) newsletters (Sequence no. 3).

1.4.6 Fact Sheets. As required by the base IRP Program, prepare and submit fact sheets which facilitate the public's understanding of the IRP Program. These sheets should include key community concerns regarding sites as specified by the base. Use the format agreed to by the base and TPM. Print and distribute the fact sheets as agreed to by the TPM. Assume a maximum of two (2) fact sheets (Sequence no. 3).

1.4.7 Public Notices. In accordance with paragraph 1.3.6.2, prepare and submit public notices for the Fairbanks and local newspapers. Use the format agreed to by the base and TPM (Sequence no. 3).

1.4.8 Photo Notebook. In accordance with paragraph 1.3.6.3, develop a photo notebbok which focuses on the overall base IRP Program. Prior to implementation, submit a conceptual layout of the notebook for review by the base and TPM (Sequence no. 9).

1.4.9 Mailing List. In accordance with the base Community Relations coordinator and paragraph 1.3.6.4, update the existing mailing list on a quarterly basis (Sequence no. 3).

1.4.10 Maps. In accordance with the base community Relations coordinator and paragraph 1.3.6.5, prepare presentation quality maps.

II. Site Location and Dates

Dew Line Sites and Cape Lisburne, date to be established.

III. Base Support The base will:

3.1 Provide the contractor with existing engineering plans, drawings, diagrams, aerial photographs, digitized map files, etc., to facilitate evaluation of IRP sites under investigation.

DEWSCOPG.DOC

3.2 Arrange for personnel identification badges, vehicles passes, and/or entry permits with the contention the contractor will provide necessary information to the base personnel no less than four weeks before needed.

3.3 Provide the contractor with all previously approved documents which provide information on all IRP efforts conducted at Dew Line Sites and Cape Lisburne and will aid in the determination of the amount of field work and analyses which need to be conducted.

IV. Government Furnished Property

See above in section III.

V. Government Points of Contact:

5.1 MAJCOM Coordinator

Major James R. Williams III
AFCEE/ESRU
8001 Inner Circle DR STE 2
Brooks AFB TX 78235-5328
(210) 536-5243
DSN 240-5243
(210) 536-9026 FAX
DSN 240-9026

5.2 Restoration Team Chief

Mr. Marty M. Faile
AFCEE/ESRU
8001 Inner Circle DR STE 2
Brooks AFB TX 78235-5328
(210) 536-5243
DSN 240-5243
(210) 536-9026 FAX
DSN 240-9026

5.3 Base Point of Contact (POC)

Mr. Jim Wolfe
11 CEOS/DEVR
21885 Second Street
Elmendorf AFB AK 99506-4420
(907) 552-4532
DSN 317-552-4532
(907) 552-1533 FAX
DSN 317-552-1533

5.4 Public Affairs Coordinator

Ms. Wende Wolf
11 CEOS/DEVR
21885 Second Street
Elmendorf AFB AK 99506-4420
(907) 552-4532
DSN 317-552-4532
(907) 552-1533 FAX
DSN 317-552-1533

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VI. Deliverables

6.1 Attachment 1 of the Basic Contract

Sequence numbers 1 and 5 listed in attachment 1 to the basic contract app. all orders. Guidance for preparing R&D Status Reports (sequence 1) is contained in the Handbook, section 4. In addition, the sequence numbers ar dates listed below are applicable to this order:

| Sequence No. | SOW No. | Block 10 (Freq.) | Block 11 (as of date) | Block 12 (date of 1st submit.) | Block 13 (date of final report) | Block 14 (no. of copies) |
|---|---|---|---|---|---|---|
| 3 (NETWORK ANALYSIS) | 1.1.4.1a | QTRLY | 12APR93 | 30APR93 | a | 4 |
| 4 (WORK PLAN) | 1.1.4.1b | ONE/R | 12APR93 | 30MAY93 | 30JUL93 | b |
| 4 (SAP) | 1.1.1.4c | ONE/R | 12APR93 | 30MAY93 | 30JUL93 | b |
| 4 (HSP) | 1.1.4.1d | OTHER | 12APR93 | 30MAY93 | - | 10 |
| 4 (COMM. REL. PLAN) | 1.1.1.4e | ONE/R | 12APR93 | 30MAY93 | 31DEC93 | b |
| 16 (SPECIAL NOTIF.) | 1.1.6.2 | OTHER | c | c | - | 3 |
| 9 (PRESENT. MATERIAL) | 1.1.6.3 | ASREQ | d | d | - | 10 |
| 10 (MTG. RPTS) | 1.1.6.4 | ONE/R | e | e | - | 6 |
| 3 (NEWSLETTER) | 1.1.4.5 | QTRLY | 12APR93 | 30NOV93 | a | f |
| 3 (FACT SHEETS) | 1.1.4.6 | ASREQ | 12APR93 | 15JUL93 | g | - |
| 3 (PUBLIC NOTICES) | 1.1.4.7 | ASREQ | 12APR93 | 15JUL93 | g | |
| 9 (PHOTO NOTEBOOK) | 1.1.4.8 | OTHER | 12APR93 | 15JUL93 | - | - |
| 3 (MAILING LIST) | 1.1.4.9 | QTRLY | 12APR93 | 15JUL93 | a | 2 |
| 3 (MAPS) | 1.1.4.10 | OTHER | 12APR93 | 15JUL93 | - | |

6.2 Reserved.

6.3 Notes

a. Submit Quarterly Thereafter.

b. One (1) first draft plan (8 copies), one (1) second draft plan (8 copies), and one (1) final plan (10 copies) are required. Incorporate Air Force comments into the second draft and final plan as specified by the TPM. Supply AFCEE/ESR with an advance copy of the first draft, second draft, and final plan for acceptance prior to distribution. Distribute the remaining copies of each plan as specified by the TPM. The second and final reports shall be submitted within three (3) weeks of receipt of comments from the TPM.

c. Primary and Secondary Documents. One first draft report (25 copies), one second draft report (25 copies), and one final report (35 bound copies plus the original camera-ready copy and a 3.5 inch disk formatted in WordPerfect 5.1 containing the document file) are required. Incorporate Air Force comments into the second draft and final reports as specified by the TPM. Supply the TPM with an advance copy of the first draft, second draft, and final reports for acceptance prior to distribution. Distribute the remaining copies as specified by the TPM .

d. Provide written notice with supporting documentation within three (3) days of telephone notification and at the direction of the TPM. Assume a maximum of 100 pages.

e. Provide within one (1) week of task/meeting completion.

f. Provide 500 copies of the Newsletters and distribute as agreed to by the TPM. This includes mailing the final product to on-base personnel and addresses on the existing mailing list.

g. Provide draft and final deliverables. Provide two advance copies to the AFCEE TPM and to the 11 CEOS Community Relations Coordinator for acceptance prior to preparation of the final deliverables.

h. Provide poster-size map.

DEWSCOPO.DOC

REF 68X 68X

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. PAGE 1 OF 3

| 2. PROC INSTRUMENT ID NO. (PIIN) | 3. SPIIN | 4. EFFECTIVE DATE | 5. REQUISITION/PURCHASE REQUEST PROJECT NO. | 6. BCC/DMS RATING |
|---|---|---|---|---|
| F33615-90-D-4010 | 002201 | | FY7624-93-08305 | -- |

7. ISSUED BY CODE FQ2826

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIEL COMMAND
HUMAN SYSTEMS CENTER/PK
8005 9TH STREET
BROOKS AFB TX 78235-5353
Buyer: EDWIN CUSTODIO/HSC-PKVBA
Phone: (210) 536-4493

8. ADMINISTERED BY (IF OTHER THAN BLOCK 7) CODE S2404A

DCMAO, BALTIMORE
200 TOWNSONTOWN BLVD., WEST
TOWNSON MD 21204-5299

9. CONTRACTOR NAME AND ADDRESS CODE 69148 FACILITY CODE

ICF TECHNOLOGY
9330 LEE HIGHWAY
FAIRFAX VA 22031-1207
COUNTY; FAIRFAX
PHONE: (703) 934-3000

MAIL DATE
JUN 1 ? 1993

IF "9" FOR MULTIPLE FACILITIES SEE SECT "K"

MAILING ADDRESS;
ICF TECHNOLOGY, INC
ATTN: CYNTHIA L. FALCE
FOUR GATEWAY CENTER 12TH FLOOR
PITTSBURGH PA 15222

10. SECURITY CLAS U

11. DISCOUNT FOR PROMPT PAYMENT

1 ST % DAYS NET DAYS
2 ND % DAYS OTHER IF "9"
3 RD % DAYS SEE SECT "E"

12. PURCHASE OFFICE POINT OF CONTACT
MVH/M6V/MVY

13. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 17. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended

14. THIS BLOCK APPLIES ONLY TO MODIFICATION OF CONTRACTS

☐ THIS CHANGE IS ISSUED PURSUANT TO ______ THE CHANGES SET FORTH HEREIN ARE MADE TO THE ABOVED NUMBERED CONTRACT/ORDER.

☐ THE ABOVE NUMBERED CONTRACT IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (SUCH AS CHANGES IN PAYING OFFICE, APPROPRIATION DATA, ETC.) SET FORTH HEREIN.

☐ THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF ______ IT MODIFIES THE ABOVE NUMBERED CONTRACT AS SET FORTH HEREIN.

☒ THIS MODIFICATION IS ISSUED PURSUANT TO FAR 52.243-3, Changes - Time and Materials or Labor Hours ~~(Aug 1987)~~

15. CONTRACT ADMINISTRATION DATA

| A. KIND OF MOD | B. MOD ABST RECIPIENT ADP PT | C. DATE OF SIGNATURE MODIFICATION | D. CHANGE IN CONTRACT AMOUNT INCREASE (+) DECREASE (-) | E. LOSING PO/CAO ON TRANSFER | F. GAINING PO/CAO ON TRANSFER | G. SVC/AGENCY USE |
|---|---|---|---|---|---|---|
| C | | | $ | | | |

16. ENTER ANY APPLICABLE CHANGES

| A. PAY CODE | B. EFFECTIVE DATE OF AWARD | C. CONTRACT (1) TYPE (2) KIND | D. TYPE CONTR | E. SURV CRIT | F. SPL CONTR PROVISIONS | G. PAYING OFC CODE | H. DATE SIGNED | I. SECURITY (1) CLAS (2) DATE OF DD 254 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | - | |

17. REMARKS (Except as provided herein, all items and conditions of the contract, as heretofore changed, remain unchanged and in full force and effect.) SUBJ: INCREASE IN CEILING AMOUNT

PROJECT OFFICER: MICHAEL F. MCGHEE, AFCEE/ESR, 8001 INNER CIRCLE, SUITE 2, BROOKS AFB, TX 78235-5328
FINANCE OFFICE:(SC1010) DFAS-COLUMBUS CENTER
ATTN: INDEPENDANCE
P.O. BOX 182362, COLUMBUS OHIO 43218-2362

18. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ______ COPIES TO ISSUING OFFICE

19. CONTRACTOR/OFFEROR (Signature of person authorized to sign)
BY

22. UNITED STATES OF AMERICA (Signature of Contracting Officer)
BY Gary J. Macdecy

20. NAME AND TITLE OF SIGNER (Type or print)

21. DATE SIGNED

23. NAME OF CONTRACTING OFFICER (Type or print)
GARY J. MACDECY

24. DATE SIGNED
93 Jun 16

AFMC FORM 702, JUL 92 REPLACES AFSC FORM 702, AUG 84 WHICH IS OBSOLETE

1. Pursuant to the "Changes" Clause of Section I of the basic contract. The ceiling amount for the order is increased by $99,986. from $299, 855. to $399,841. The performance period remains the same, 31 DEC 93,as a result of this change.

2. As a result of paragraph 1 above, said order is more specifically modified as follows:

a. SECTION A - Cover page - The NTE amount in Block 20 (Cover Page) is increased by $99,986. from $299,855. to $399,841.

b. SECTION B - Supplies and Services - Establish Special ACRN XA.

| Item No | Supplies/Services | Quantity Purch Unit | Unit Price Total Item Amt |
|---|---|---|---|
| 0001 | CLIN Change sec class: U<br>noun: SAMPLING, ANALYSIS, AND DATA<br>acrn: XA nsn: N<br>site codes pqa: D acp: D fob: D<br>type contract: Y | | N<br>N |
| 0002 | CLIN Change sec class: U<br>noun: SUPPORT<br>acrn: XA nsn: N<br>site codes pqa: D acp: D fob: D<br>type contract: Y | | N<br>N |

c. SECTION C - Description/Specs/Work Statement - The SOW for this order remains the same as the Basic order entitled, "Installation Restoration Program/Remedial Investigation/Feasibility Study for Distant Early Warning (DEW) Line Sites and Cape Lisburne AFS, AK" dated 16 MAR 93.

d. SECTION F - Supplies Schedule Data - is modified to include ACRN AB and Special ACRN XA.

| Item No | Supplies Schedule Data | Delivery Quantity | Schedule Date |
|---|---|---|---|
| 0001 | CLIN Del Sch Change sec class: U<br>acrn: XA<br>ship to: U | 1 | 93DEC31 |

0002 CLIN Del Sch Change sec class: U
acrn: XA
ship to: U 1 93DEC31

e. SECTION G. - Accounting Classification Data - is amended as set forth below:

| ACRN | Acct Class Data | Appropriation/Lmt Subhead/CPN Recip DODAAD Supplemental Accounting Classification | | Obligation Amount |
|---|---|---|---|---|
| AB | ACCOUNT ESTABLISH | | | |
| | UNCLASSIFIED | 5733400 | F74400 | $99,986.00 |
| | | 303 7434 434419 000007 53440 000000 | 674400 | |
| | pr/mipr data: FY7624-93-08305 | | | |
| XA | SPECIAL ACRN ESTABLISH UNCLASSIFIED | | | |

descriptive data:
Special ACRN XA funds CLINs 0001 and 0002 and includes the following:

ACRN AA: $299,855.
AB: $ 99,986.
TOTAL $399,841.

**Finance Officer:** Pay Funds in Alphabetical Order.

3. This supplemental agreement constitutes full settlement of any claims of the contractor under the contract, including the clause entitled, "Changes", arising out of or in connection with the changes effected hereby.

REF 68X — 68X

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. PAGE 1 OF 2

| 2. PROC INSTRUMENT ID NO. (PIIN) | 3. SPIIN | 4. EFFECTIVE DATE | 5. REQUISITION/PURCHASE REQUEST PROJECT NO. | 6. BCC/DMS RATING |
|---|---|---|---|---|
| F33615-90-D-4010 | 002202 | 93JUL23 | FY7624-93-08353 | -- |

7. ISSUED BY CODE FQ2826

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIEL COMMAND
HUMAN SYSTEMS CENTER/PK
8005 9TH STREET
BROOKS AFB TX 78235-5353
Buyer: REBECCA ROUNSAVILL/PKVBA
Phone: (210) 536-4502

8. ADMINISTERED BY (IF OTHER THAN BLOCK 7) CODE S2404A

DCMAO, BALTIMORE
ATTN: CHESAPEAKE
200 TOWNSONTOWN BLVD, WEST
TOWNSON MD 21204-5299

9. CONTRACTOR NAME AND ADDRESS CODE 69148 FACILITY CODE

ICF TECHNOLOGY
9330 LEE HIGHWAY
FAIRFAX VA 22031-1207
COUNTY; FAIRFAX
PHONE: (703) 934-3000

MAIL DATE
JUL 26 1993

IF "Y" FOR MULTIPLE FACILITIES SEE SECT "K"

MAILING ADDRESS;
ICF TECHNOLOGY, INC
ATTN: CYNTHIA L. FALCE
FOUR GATEWAY CENTER 12TH FLOOR
PITTSBURGH PA 15222

10. SECURITY CLAS U

11. DISCOUNT FOR PROMPT PAYMENT

1 ST . DAYS — NET DAYS
2 ND . DAYS — OTHER IF "Y"
3 RD . DAYS — SEE SECT "E"

12. PURCHASE OFFICE POINT OF CONTACT

MVX/M6V/MVY

13. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITCATIONS

☐ The above numbered solicitation is amended as set forth in block 17. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended by on of the following methods:

(a) By signing and returning ____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

14. THIS BLOCK APPLIES ONLY TO MODIFICATION OF CONTRACTS

☐ THIS CHANGE IS ISSUED PURSUANT TO ____ THE CHANGES SET FORTH HEREIN ARE MADE TO THE ABOVED NUMBERED CONTRACT/ORDER.

☐ THE ABOVE NUMBERED CONTRACT IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (SUCH AS CHANGES IN PAYING OFFICE, APPROPRIATION DATA, ETC.) SET FORTH HEREIN.

☐ THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF ____ IT MODIFIES THE ABOVE NUMBERED CONTRACT AS SET FORTH HEREIN.

☒ THIS MODIFICATION IS ISSUED PURSUANT TO FAR 52.253-3, Changes - Time and Materials or Labor Hours. (AUG 1987)

15. CONTRACT ADMINISTRATION DATA

| A. KIND OF MOD | B. MOD ABST RECIPIENT ADP PT | C. DATE OF SIGNATURE MODIFICATION | D. CHANGE IN CONTRACT AMOUNT INCREASE (+) DECREASE (-) | E. LOSING PO/CAO ON TRANSFER | F. GAINING PO/CAO ON TRANSFER | G. SVC/AGENCY USE |
|---|---|---|---|---|---|---|
| C | | | $ | | | |

16. ENTER ANY APPLICABLE CHANGES

| A. PAY CODE | B. EFFECTIVE DATE OF AWARD | C. CONTRACT (1) TYPE (2) KIND | D. TYPE CONTR | E. SURV CRIT | F. SPL CONTR PROVISIONS | G. PAYING OFC CODE | H. DATE SIGNED | I. SECURITY (1) CLAS (2) DATE OF DD 254 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

17. REMARKS *(Except as provided herein, all items and conditions of the contract, as heretofore changed, remain unchanged and in full force and effect.)* SUBJ: INCREASE IN CEILING AMOUNT

PROJECT OFFICER: MICHAEL F. MCGHEE, AFCEE/ESR, 8001 INNER CIRCLE, SUITE 2, BROOKS AFB, TX 78235-5328

FINANCE OFFICE: (SC1030) DFAS-COLUMBUS CENTER
ATTN: DFAS-CO/CHESAPEAKE DIVISION
P.O. BOX 182264, COLUMBUS OHIO 43218-2264

18. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ____ COPIES TO ISSUING OFFICE

19. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*
BY

22. UNITED STATES OF AMERICA *(Signature of Contracting Officer)*
BY Gary J. Macdecy

20. NAME AND TITLE OF SIGNER *(Type or print)*

21. DATE SIGNED

23. NAME OF CONTRACTING OFFICER *(Type or print)*
GARY J. MACDECY

24. DATE SIGNED
93 Jul 23

AFMC FORM 702, JUL 92 — REPLACES AFSC FORM 702, AUG 84 WHICH IS OBSOLETE

REFERENCE: AF Form 616 H93-SR329, DATED: 9 JUL 93; EXPIRES: 15SEP 93; $2,9M

1. Pursuant to the "Changes" Clause of Section I of the basic contract. The ceiling amount for the order is increased by $2,899,511.00 from $399,841.00 to $3,299,352.00. The performance period is changed to 94 Feb 15, as a result of this change.

2. As a result of paragraph 1 above, said order is more specifically modified as follows:

a. SECTION A Cover page - The NTE amount in Block 20 (Cover Page) is increased by $2,899,511.00 from $399,841.00 to $3,299,352.00.

b. SECTION B - Supplies and Services - Establish Special ACRN XA.

| Item No | Supplies/Services | Quantity<br>Purch Unit | Unit Price<br>Total Item Amount |
|---|---|---|---|
| 0001 | CLIN Change sec class: U<br>noun: SAMPLING, ANALYSIS AND DATA<br>acrn: XA nsn: N<br>site codes pqa: D acp: D fob: D<br>type contract: Y | | N<br>N |
| 0002 | CLIN Change sec class: U<br>noun: SUPPORT<br>acrn: XA nsn: N<br>site codes pqa: D acp: D fob: D<br>type contract: Y | | N<br>N |
| 0004 | CLIN Establish sec class: U<br>noun: CHEMICAL ANALYSES<br>acrn: XA nsn: N<br>site codes pqa: D acp: D fob: D<br>pr/mirp Data: FY7624-93-08353<br>type contract: Y | 1<br>LO | N<br>N |

c. SECTION C - Description/Specs/Work Statement - The SOW for this order entitled, "Installation Restoration Program Remedial Investigation/Feasibility Study, Stage 1, Distant Early Warning (DEW) Line Sites and Cape Lisburne AFS, AK", dated 6 JUL 93 is attached hereto as Attachment #1 to this modification.

d. SECTION F - Supplies Schedule Data is modified to include ACRN AB and Special ACRN XA.

| Item No | Supplies Schedule Data | | Delivery Quantity | Schedule Date |
|---|---|---|---|---|
| 0001 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | sec class: U | 1 | 95JANØ1 |
| 0002 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | sec class: U | 1 | 95JANØ1 |
| 0004 | CLIN Del Sch Establish<br>acrn: XA<br>ship to: U | sec class: U | 1 | 95JANØ1 |

e. SECTION G - Accounting Classification Data - is amended as set forth below:

| ACRN | Acct Class data | Appropriation/Lmt Subhead/CPN Recip DODAAD<br>Supplemental Accounting Classification | | Obligation Amount |
|---|---|---|---|---|
| AB | ACCOUNT CHANGE<br>UNCLASSIFIED | 5733400<br>303 7434 434419 000007 53440 000000 674400 | F74400 | $2,899,511.00+ |
| | pr/mipr data: | | | |
| XA | SPECIAL ACRN CHANGE<br>UNCLASSIFIED | | | |

descriptive data:
Special ACRN XA funds CLINs 0001, 0002 and 0004 and includes the following:

| | | |
|---|---|---|
| ACRN AA: | $ 299,855.00 | |
| AB: | $ 99,986.00 | (MOD 0022-01) |
| | $2,899,511.00 | (MOD 0022-02) |
| TOTAL | $3,299,352.00 | |

**FINANCE OFFICER:** Pay funds in alphabetical order.

3. This supplemental agreement constitutes full settlement of any claims of the contractor under the contract, including the clause entitled, "Changes", arising out of or in connecting with the changes effected hereto.

1993 JUL 6

# STATEMENT OF WORK
INSTALLATION RESTORATION PROGRAM
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

STAGE 1

DISTANT EARLY WARNING (DEW) LINE SITES and CAPE LISBURNE AFS, AK

## I. DESCRIPTION OF WORK

### 1.1 Scope

1.1.1 **Background.** The objective of the Air Force Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan (NCP) for those sites which pose a threat to human health and welfare or the environment. This objective is achieved through a Remedial Investigation Feasibility Study (RI/FS) process in which conclusions and recommendations drawn from accurate and validated data are used to structure and guide subsequent activities.

The RI/FS process includes scoping to define data requirements and objectives, a remedial investigation to characterize sites for a baseline risk assessment, and a feasibility study to define and evaluate alternative remedial actions so that a recommended action may be selected. Each of these steps of the RI/FS process can be conducted in stages that focus on particular aspects of the process.

The contractor shall accomplish the actions described in this Statement of Work (SOW) to complete the RI/FS process at the following seven Dew Line Sites and Cape Lisburne:

Barter Island AFS (BAR-M); Bullen Point AFS (POW-3); Point Lonely AFS (POW-1); Point Barrow AFS (POW-M); Point Lay AFS (LIZ-2); Wainwright AFS (LIZ-3); and Oliktok Point AFS (POW-2).

1.1.2 **Requirements for Project Activities.** The Installation Restoration Program (IRP) Handbook referenced in this Statement of Work provides requirements for laboratory and field activities and applicable formats for project documents that shall be used by the contractor. Volume 1 of the Handbook dated May 1992 is provided under separate cover. This document is referenced in this Statement of Work as the Handbook.
The contractor is responsible for the thorough knowledge and understanding of the previous findings and recommendations that affect this task prior to the start of field activities. The documents involved include but are not limited to the IRP Phase I Records Search, and the IRP Phase II plans and reports addressing the Dew Line Sites and Cape Lisburne.

1.1.3 **Meetings.** A maximum of two (2) contractor personnel, including the project leader, shall attend ~~four (4)~~ eight (8) meetings at Elmendorf AFB, AK. Each meeting shall be two (2) 8-hour workdays in duration. All meetings shall be coordinated by the Restoration Team Chief (RTC).

1.1.4 **Special Notifications.** The contractor shall immediately report to the RTC, or designate, via telephone, any data or results generated during this investigation which may indicate an imminent health risk. Following this telephone notification, a written notice shall be prepared and

delivered within three (3) days. This notification shall include supporting documentation (sequence 16, para 6.1)

## 1.2 Project Scoping Documents

The purpose of the project scoping documents is to clearly and comprehensively define project activities prior to the initiation of field work. The contractor shall prepare and submit the following project scoping documents for this task prior to the initiation of any field activities or laboratory analyses.

1.2.1 **Engineering Network Analysis.** Provide within ten (10) days after the issuance of an order a computer generated network analysis which is a detailed task plan for the RI/FS work efforts. The network analysis (GANTT) chart shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period of the delivery order. The network analysis (GANTT) shall show both serial and parallel subtasks leading to a deliverable product or report, and shall show early and late start and completion dates with float. The network analysis (GANTT) shall be updated and submitted quarterly (sequence 3, para 6.1).

1.2.2 **Work Plan.** This section will discuss the overall approach, (including a brief summary of the Conceptual Site Model and Data Quality Objectives), major tasks, scope, timeline, and major decision points. Due to the extreme remoteness of the Dew Line Sites and Cape Lisburne, the contractor shall include a detailed plan for logistics and strategy to complete the RI/FS field activities. Follow the format specified in section 1 of the Handbook. In preparing the Work Plan, use previous reports and the information gathered during the literature search and presurvey along with experience at similar sites. Reevaluate the recommendations for Dew Line Sites and Cape Lisburne developed during previous IRP stages (sequence 4, para 6.1).

1.2.3 **Sampling and Analysis Plan (SAP).** The SAP consists of a quality assurance plan (QAPP) and a Field Sampling Plan (FSP). Prepare a SAP describing how project activities will be accomplished in the format specified in section 1 of the Handbook. Incorporate review comments and obtain RTC concurrence prior to the start of field activities (sequence 4, para 6.1).

1.2.4 **Health and Safety Plan (HSP).** Provide a written Health and Safety Plan within eight (8) weeks after the issuance of an order. The contractor shall comply with USAF, OSHA, EPA, state, and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for designating the appropriate levels of protection needed at the study sites. The Health and Safety Plan shall provide no less protection than the protection contained in the manual entitled "Health and Safety Requirements for Employees Engaged in Field Activities" dated 1981 and the "Occupational Safety and Health Manual for Hazardous Waste Sites Activities" dated 1985 and 29 CFR 1910. Coordinate the Health and Safety Plan directly with applicable regulatory agencies prior to submittal to AFCEE/ESR. The contractor shall certify to AFCEE/ESR that the contractor has reviewed the coordinated Health and Safety Plan with each employee and also subcontractor's employees prior to the time each employee engages in field activities (sequence 4, para 6.1).

1.2.5 **Community Relations Plan.** The contractor shall prepare a Community Relations Plan (CRP) for the DEW Line Sites and Cape Lisburne AFS outlining the specific public communications and involvement techniques to be used in coordination with remedial site activities (sequence 4, para 6.1). Follow the guidance contained in "Community Relations in Superfund, a Handbook", office of Solid Waste and Emergency Response (OSWER) Directive

9230.0-03C (EPA/540/R-92/009, January 1992, PB92-963341), and other applicable directives. Also, use as a guidance previously accomplished CRP from other installations in Alaska. Appropriately adapt such guidance to the local situation at the DEW Line Sites and Cape Lisburne. As described in OSWER Directive 9230.0-03C, the CRP shall include, but not be limited to, a description of the sites and the community, an overview of the community involvement to date, key community concerns regarding the site and AF site activities, and suggested community relations activities. A contact list of elected officials, agency representatives, and interested groups and individuals shall be included in appropriate copies of the plan. In addition, the plan will include suggested locations for meetings and information repositories. Contractor activities to develop the CRP shall include conducting a review of site information provided by the AF.

## 1.3 Project Activities

The contractor shall conduct the following tasks to achieve the purposes stated herein, in compliance with approved scoping documents, the Handbook, and all applicable regulations and requirements.

1.3.1 **Community Relations.** Provide support to the base public affairs office for the tasks described below pertaining to the RI/FS Community Relations Program.

1.3.1.1 Public meetings and workshops. The contractor shall be responsible for coordinating public meetings and workshops for all DEW Line Sites and Cape Lisburne AFS. This includes producing briefing scripts, slides and any associated products such as response cards and sign-in sheets. As requested by the base Community Relations office in coordination with the RTC, research and provide materials for public queries, news media queries, and news releases. Assume a maximum of one (1) workshop/meeting (Seq. nos. 3,9).

1.3.1.2 Public notices. As required by the base Community Relations office and the RTC, the contractor shall prepare and publish public notices for the Fairbanks and local newspapers. The purpose of these notices is to inform the public of a meeting, workshop, or comment period in which they have the opportunity to be involved in the IRP Program at DEW Line Sites and Cape Lisburne AFS. Also, these notices may be utilized to inform the public of other pertinent program information such as quarterly notices of documents placed in the information repositories. The format for the notices shall be coordinated with the Community Relations office and RTC, and then submitted to the RTC for review prior to delivery to the base. Assume a maximum of two (2) notices (Seq. no. 3).

1.3.1.3 Photo Notebook. The contractor shall develop a photo notebook which focuses on the overall IRP program at DEW Line Sites and Cape Lisburne AFS. The layout of the notebook will be coordinated with the public affairs office and RTC. Assume a maximum of one (1) update (Seq. no. 9).

1.3.1.4 Mailing List. In coordination with the base Community Relations office and the RTC, prepare and update the mailing list on a quarterly basis. Assume a maximum of two (2) updates (Seq. no. 3).

1.3.1.5 Maps. Prepare presentation quality maps of the installations and their sites to use in newsletters and to distribute to the public.

1.3.1.6 Information Repository/Administrative Record. Prepare a listing of all documents required for the Information Repository and Administrative Record. Create an Informatin Repository and Administrative Record. The Reporsitory and Record will be maintained by the 11 CEOS/CEVR Community Relations Coordinator. Assume two locations for the Repository and Record, one in Anchorage and another in Elmendorf AFB, AK. Actual locations will be determined by the 11 CEOS/CEVR Community Relations Coordinator.

1.3.2 **Literature Search.** Conduct a literature search and analyze aerial photos of the DEW Line Sties to supplement existing information that has been collected. The purpose of the literature search is to complete the conceptual site model so that a numerical estimate of risk can be developed.

1.3.3 **Presurvey.** Within eight weeks of the issuance of an order, the contractor shall visit the Dew Line Sites and Cape Lisburne to ensure complete understanding of site conditions. Coordinate this visit with the RTC and the 11 CEOS project manager. The contractor shall look for evidence of contamination at each site visited (e.g., leaking drums, vegetative stress, leachate seeps). The contractor shall observe the physical settings of each site visited to formulate specific recommendations concerning boring placement, use of geophysical techniques, and other aspects of the proposed field investigation. The findings of the presurvey shall be used to prepare the Work Plan, SAP, and HSP for the RI and to prepare scoping documents for the treatability study(ies). Assume one presurvey and one reconnaisance trips.

1.3.4 **Quality Assurance/Quality Control (QA/QC).** A QA/QC program shall be conducted and documented for all work pursuant to this delivery order. Contractor and project-specific documents concerning QA/QC procedures and requirements shall be strictly followed. Data generated under the QA/QC program shall be used by the contractor for evaluating the analytical results and field records assembled for each site to identify accurate and validated data that may be used to assess risk, develop conceptual site models and evaluate alternatives.

1.3.5 **Conceptual Site Model.** Use all available RI/FS data supported by acceptable QA/QC results (as measured against QAPP requirements) and site characterization information to refine, based on newly collected data, the conceptual site model. The model shall define the nature and extent of contamination and the transport and fate of those contaminants. The minimum requirements of the model are given in section 2 of the Handbook. The complexity and detail of the site model shall be consistent with the nature of the site and site problems, and the amount of data available the conceptual site model shall be documented in the Work Plan.

1.3.6 **ARARs Evaluation.** The contractor shall identify all Applicable or Relevant and Appropriate Requirements (ARAR). These ARARs will be documented in the Work Plan.

1.3.7 **Data Collection, Sampling, and Analysis Procedures.** The contractor shall conduct field activities, sampling, laboratory analysis, and data quality assessment. Section 2 of the Handbook is recommended for the contractor to follow. The contractor shall conduct all activities in accordance with the WP and the SAP approved by the COR. The COR shall be notified in writing of any planned deviation from the activities specified in these documents. COR approval of deviations is required prior to performance.

The field investigation (including all drilling and sampling operations) shall be supervised by a registered geologist, hydrogeologist, or professional engineer. If required by the state, the on-site field supervisor shall be

certified by the state to install test wells. A detailed log of field conditions, materials penetrated during drilling, well completion, and sampling conditions, as described in Section 2 of the Handbook, shall be maintained and made available for Government inspection upon request. Decisions on well and boring locations, well depths, screened intervals, and all details of the field investigation shall be made by the COR, and the contractor's field or project supervisor.

1.3.8 **Regulatory Requirements and Permits.** All well drilling, development , sampling, laboratory analysis, and other activities pursuant to this effort shall be conducted in strict accordance with all applicable federal and state laws, ordinances, rules and regulations, and all authorities with jurisdiction over such activities. The contractor shall complete permits, applications, other documents, and proficiency tests required by the regulatory agencies. The contractor shall file documents with appropriate agencies and pay all applicable permit and filing fees. The contractor shall identify locations requiring permits to Radar Station Manager. The contractor shall include all correspondence in appendices to the technical reports in accordance with Section 4 of the Handbook.

All laboratory analyses shall conform to all applicable federal, state, and local regulatory agency requirements. If the requirements specify that certification is necessary to conduct one or more specific analyses, the contractor shall furnish documentation showing laboratory certification with the first set of analytical data supplied to AFCEE/ESR and the COR.

The contractor shall containerize and sample materials suspected to be hazardous in accordance with applicable requirements, Guidance from the Handbook, and the approved Plans. The contractor shall transport these containerized materials to a location within the installation boundary designated by the Radar Station Manager at a frequency specified by the Station Manager. The contractor shall handle, store, and/or dispose of potentially hazardous materials. The contractor shall transport and empty containerized materials determined not to be hazardous to locations within the installation boundary identified by the Station Manager.

1.3.9 **Remedial Investigation (RI).** The contractor shall conduct a RI to characterize environmental conditions; define the concentration, nature, and extent of contamination; and quantitatively estimate the risk to human health and the environment and study the area through the collection of geologic and hydrologic data, environmental samples, the laboratory analyses of those samples for potential contaminants, the evaluation of the analytical results and field measurements with respect to quality control data, and the interpretation and analysis of accurate and precise data. The purpose of data collection, sample collection, and laboratory analysis is to determine whether any contaminants generated from installation activities have entered the environment. The field investigation is used to determine the source of any identified contaminants, the magnitude of contamination relative to Applicable or Relevant and Appropriate Requirements (ARARs), and any naturally occurring or background concentrations for specific compounds. The RI shall comply with the specifications, procedures, and methodologies presented in the project-specific SAP. The COR must be notified in writing prior to any modification of or deviation from any activity described in these documents.

1.3.9.1 **Soil Borehole Drilling and Sampling and Well Installation and Sampling.** The contractor shall drill and collect samples from boreholes as specified in the SAP. The contractor shall evaluate the need to install, sample, and develop monitoring or extraction wells.

1.3.9.1.1 **Lithologic Samples.** The contractor shall describe core samples at least every five (5) feet of drilling or at each change in lithology, whichever is less, to indicate significant changes in lithology of characteristic properties that relate to the strata penetrated. Any deviations shall be coordinated with the COR. Guidance for standard identification practices are found in the Handbook. The contractor shall include in the field logbook observations made by the driller and rig geologist during drilling such as depth to water, penetration rate, drill rig behavior, and other observations that might be indicative of changes in formation characteristics. The contractor shall record depth to permafrost in all the soil borings and shall not proceed beyond five (5) feet into the permafrost layer.

1.3.9.1.2 **Drill Cuttings and Drilling Fluids.** The contractor shall containerize all drill cuttings and drilling fluids. All drill cuttings and drilling fluids shall be managed and disposed of in accordance with the project SAP. (Note: The contractor shall be responsible for providing all necessary containers.) The contractor shall be responsible for the logistics of the ultimate disposal of all drill fluids or drill cuttings deemed hazardous in accordance with current EPA off-site disposal policy and state and/or local hazardous waste disposal laws. The contrator shall coordinate with the Station Manager for on-site placement and disposal of all drill cuttings, fluids, purge fluid, and excavated material. If on-site disposal is excluded, all hazardous waste shall be transported by a permitted hazardous waste transporter to a licensed Resource Conservation and Recovery Act (RCRA) approved facility and be accompanied by a Uniform Hazardous Waste Manifest. The contractor shall provide a final, completed copy of the hazardous waste manifest to the 11 CEOS/CEVR. The Radar Stations' hazardous waste managers will sign all hazardous waste manifest documents.

1.3.9.1.3 **Well/Boring Precautions.** The contractor shall mark the field locations of all borings during the planning/mobilization phase of the field investigation. The contractor shall consult with base personnel to minimize the disruption of base activities, to properly position wells with respect to site locations, and to avoid penetrating underground utilities. The contractor shall obtain all permits prior to commencement of digging and drilling operations. The contractor shall utilize a registered land surveyor in determining the elevations and locations of all off-base background study borings. All borings and wells from which samples are taken shall be surveyed by the contractor for vertical and horizontal control. The contractor shall record the positions on project and site specific maps. Bench marks used must have been previously established from and be traceable to a U. S. Coast and Geodetic Survey (USCGS) or U. S. Geological Survey (USGS) survey marker. Clearly identify all bench mark locations on the base map.

1.3.9.1.4 **Water-Level Measurements in Boreholes.** The contractor shall measure water levels in all boreholes after the water level has stabilized. Include this information and the date of measurement in the boring logs. Also, record soil moisture conditions (moist, wet, saturated, etc.) in the boring log.

1.3.9.1.5 **Air Monitoring During Drilling.** The contractor shall monitor the ambient air in the breathing zone above the borehole during all drilling with an appropriate organic vapor analyzer to identify potentially hazardous and/or toxic vapors. Include air monitoring results in borehole logs.

1.3.9.1.6 **Subsurface Soil Sampling.** The contractor shall collect soil samples from borings as specified in the SAP. The SAP specifies the analytical methods, the parameters for analysis, and the estimated number of analyses for soil samples.

1.3.9.1.7 **Well Construction Requirements.** The contractor shall coordinate with the COR to determine well completion requirements (flush or projected above ground surface). All wells shall be secured as soon as possible after drilling. The contractor shall provide corrosion resistant locks for both flush and above-ground well assemblies. The locks shall be compatible with existing wells. The contractor shall turn the lock keys over to 11 CEOS/CEVR POC following completion of the field effort. The contractor shall coordinate with the 11 CEOS/CEVR POC, the RTC, and the COR the selection of exact well and screen placement, gravel pack design, and screen slot size.

1.3.9.1.8 **Well Logs.** For each well, the contractor shall prepare a well completion log and schematic diagram showing well construction details. Lithologic descriptions, well elevation survey data, and other information included in the well logs shall conform to the specifications of the SAP.

1.3.9.1.9 **Well Development.** The contrator shall develop each well as soon as possible. Guidance for well development procedures are found in the the Handbook. The contractor shall measure the rate of water production, pH, specific conductance, and water temperature during well development.

1.3.9.1.10 **Well Placement.** The contractor shall avoid installing wells in depressions or areas subject to frequent flooding and/or standing water. If wells must be installed in such areas, the contractor shall design the wells so standing water does not leak into the top of the casing or cascade down the annular space.

1.3.9.1.11 **Well and Borehole Clean-up.** The contractor shall clean the area following the completion of each well and borehole. The contractor shall return all sites to the original condition of the site.

1.3.9.1.12 **Groundwater and Surface Water Sampling.** The contractor shall collect groundwater and Surface Water samples from newly developed well and existing wells and from surface water bodies. The SAP shall specify the analytical methods, the parameters for analysis, and the estimated number of analyses for groundwater and surface water samples.

1.3.9.1.13 **Composite Sampling.** The contractor shall collect and analyze drill cuttings, fluids, purge fluids, and excavated material. The SAP shall specify the analytical methods, the parameters for analysis, and the estimated number of analyses for composite samples.

1.3.9.2 **Geophysical Surveys.** The contractor shall evaluate whether geophysical surveys are needed (e.g., to determine boundaries of landfills, to locate underground debris, utilities and storage tanks). Where geophysical surveys are appropriate, the contractor shall select a geophysical survey technique or techniques [such as ground penetrating radar (GPR), magnetometer or electromagnetic surveys (EM)] that will best meet the desired application. The technique(s) used shall be approved by the RTC prior to use. Approximate number of surveying days is included in Annex A which is to be used for costing purposes only. Appropriate grid systems shall be established and the contractor shall use the results of this survey to prepare a contour map of the results. Provide this map as an attachment to the first R&D Status Report

submitted after the completion of the geophysical surveys. The contractor shall perform the geophysical surveys before drilling and use the results in selecting the location of soil borings, wells, test pits, if necessary.

1.3.9.3 **Permeability Testing.** The contractor shall determine the need for a permeability test at Cape Lisburne AFS, to provide additional data on the hydrogeologic characteristics of the water table aquifer. The SAP shall specify the method to be used for the permeability test.

1.3.9.4 **Water Level Measurement.** The contractor shall evaluate the need for conducting a complete round of water level measurements in all existing and new wells at Cape Lisburne AFS at the beginning of field work and during the field sampling effort. Data gathered shall be used for interpreting groundwater flow directions and groundwater gradient.

1.3.9.5 **Soil Gas Surveys.** The contractor shall evaluate the need for soil gas surveys and Hydropunch (e.g., to select soil boring locations). If soil gas surveys and hydropunch are included as part of the approved Work Plan and FSP, the contractor shall establish appropriate grid systems. The contractor shall prepare a posting map of soil gas values relative to their location on the grid used. Provide this map as an attachment to the first R&D Status Report submitted after completion of the soil gas survey (sequence 3, para 6.1). Approximate number of surveying days are included in Annex A which is to be used for costing purposes only.

1.3.9.6 **Groundwater Field Screening.** The contractor shall perform groundwater field screening. The SAP shall specify the method, location, and type of groundwater field screening.

1.3.9.7 **Baseline Risk Assessment.** The contractor shall use data supported by acceptable QA/QC results (as measured against QAPP requirements) and the conceptual site model to numerically estimate the risk posed by site contaminants to human health and the environment. The contractor shall identify and list all ARARs for those contaminants detected in environmental samples at the site. The contractor shall provide all ARARs evaluations as an attachment to the Technical Report. Provide the results of the baseline risk assessment in the Technical Report using the formats in Section 4 of the Handbook as a guidance.

The contractor shall identify those sites posing minimal or no threat to human health, welfare, or the environment and for which no further action is appropriate.

The contractor shall use the results of the risk assessment in establishing remedial action objectives and developing remedial alternatives in the Feasibility Study.

1.3.9.8 **Defense Priority Model Scores.** The contractor shall use the Defense Priority Model to score the sites. The score shall be included as an appendix to the RI/FS Technical Report.

1.3.9.9 **Fate and Transport.** The contractor shall perform fate and transport modeling for contaminants of interest to include the projection of future contaminant concentrations within the boundaries of the site. This will be done in conjunction with the RI/FS report.

1.3.13 **Weekly Field Activity Report**

The contractor shall transmit a Weekly field activity report. The AFCEE RTC shall develop the format for the report.

1.4 **Project Deliverables**

Deliver the following documents in compliance with the requirements of item VI, the formats required in section 1 and 4 of the Handbook, and the specifications noted below. Draft reports are considered "drafts" only because they have not been reviewed and approved by the Air Force. In all other respects, "drafts" shall be complete, in the proper format, fully illustrated, and free of grammatical and typographical errors.

1.4.1 **Scoping Documents.**

a. Engineering Network Analysis (GANTT) (para 1.2.1). Provide within ten (10) days after the issuance of an order. Update and submit quarterly (sequence 3, para 6.1).

b. Work Plan (para 1.2.2). Use the format in section 1 of the Handbook (sequence 4, para 6.1).

c. Sampling and Analysis Plan (1.2.3). Use the format in section 1 of the Handbook (sequence 4, para 6.1).

d. Health and Safety Plan (para 1.2.4). Provide within six (6) weeks after the issuance of an order (sequence 4, para 6.1).

e. Community Relations Plan (para 1.2.5). Provide within eight (8) weeks after issuance of an order (sequence 4, para 6.1).

1.4.2 **Special Notification.** Provide written notification of imminent health hazards and supporting documentation within three (3) days of telephone notification (sequence 16, para 6.1).

1.4.3 **Presentation Materials.** The contractor shall prepare and present up to two (2) presentation packages at meetings coordinated by the Air Force (sequence 9, para 6.1). Attendance of these meetings is included in paragraph 1.1.3 of this SOW. As part of the presentation materials, the contractor shall provide paper copies of all slides and overheads.

1.4.4 **Meeting Summaries** (para 1.1.3). Provide no later than five (5) days after conclusion of each meeting (sequence 18, para 6.1).

1.4.5 **Newsletter.** Prepare and submit a quarterly newsletter which presents the status of the entire base IRP Program. This will include preparing an outline resulting from input by all contractors involved in the program. The outline must be approved by the base and RTC prior to submittal of the newsletter. The final product will be printed and distributed as agreed to by the RTC. Assume a maximum of two (2) newsletters (Sequence no. 3).

1.3.10 **Feasibility Study (FS).** The contractor shall perform a FS concurrently with the RI. As much of the FS as possible shall be performed early in the RI/FS process and refined as additional RI data are obtained. The contractor shall use the information from the RI and the baseline risk assessment to develop and evaluate remedial action alternatives for each site where a threat to human health or the environment exists. The contractor shall follow the procedures specified in USEPA OSWER Directive 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." The contractor shall employ streamlining methods wherever possible and develop and evaluate the minimum number of alternatives needed to provide a range of promising treatment and containment actions. The contractor shall eliminate impracticable alternatives from further consideration early in the FS process. The scope and level of detail shall be consistent with the nature and complexity of site problems.

1.3.10.1 **Develop and Screen Alternatives.** The contractor shall establish remedial action objectives and remediation goals for protecting human health and the environment. These objectives and goals shall be determined based on identified ARARs and acceptable exposure levels as defined in the baseline risk assessment and refined throughout the RI/FS process. Identify general response actions and applicable technologies based on site and contaminant conditions, and combine technologies to formulate distinct alternatives. The contractor shall develop alternatives which eliminate, control, and /or reduce risk to human health or the environment to acceptable levels for each pathway. Where a wide variety of promising alternatives exists, the contractor shall screen the alternatives based on effectiveness, implementability, and cost. The contractor shall detail the development and screening of the alternatives process and identify the alternatives selected for detailed analysis in the Informal Technical Information Report (ITIR).

1.3.10.2 **Detailed Screening of Alternatives.** The contractor shall conduct a detailed analysis on each alternative selected and identified in the above step and approved by the COR. Using the methodology in OSWER Directive 9355.3-01, the contractor shall evaluate each alternative against the nine criteria. In addition to the individual assessment, the contractor shall perform a comparative analysis to determine the relative performance of alternatives. The contractor shall focus the analysis on sub-factors and criteria most pertinent to each site and the scope and complexity of the proposed action. Provide a summary of the Detailed Analysis of Alternatives in the R&D report submitted following task completion. Include summary tables of the individual and comparative analyses that will be used in the Technical Report.

1.3.11 **Desicion Documents.** The contractor shall prepare and submit Decision Documents (DD) following the Handbook Section 4.4 as guidance. The purpose of the DD is to support a remedial action alternative or a no further action alternative.

1.3.12 **Site Specific Requirements.** The contractor shall perform the requirements listed in this SOW in conformance with the guidance of the Handbook, requirements of the approved WP, and the SAP. Annex A specifies the proposed values for field and laboratory activities to be conducted, specifications for field activities, information for sediment and soil samples, analytical methods, parameters for analysis, estimated number of analyses for water/sediment/soil samples, required analytical methods, estimated number of analyses for all core samples, estimated number soil gas analyses for each parameter, and field QC sample requirements for soil and water samples for costing purposes only.

1.4.6 **Fact Sheets.** As required by the base IRP Program, prepare and submit fact sheets which facilitate the public's understanding of the IRP Program. These sheets should include key community concerns regarding sites as specified by the base. Use the format agreed to by the base and RTC. Print and distribute the fact sheets as agreed to by the RTC. Assume a maximum of two (2) fact sheets (Sequence no. 3).

1.4.7 **Public Notices.** In accordance with paragraph 1.3.6.2, prepare and submit public notices for the Fairbanks and local newspapers. Use the format agreed to by the base and RTC (Sequence no. 3).

1.4.8 **Photo Notebook.** In accordance with paragraph 1.3.6.3, develop a photo notebbok which focuses on the overall base IRP Program. Prior to implementation, submit a conceptual layout of the notebook for review by the base and RTC (Sequence no. 9).

1.4.9 **Mailing List.** In accordance with the base Community Relations coordinator and paragraph 1.3.6.4, update the existing mailing list on a quarterly basis (Sequence no. 3).

1.4.10 **Maps.** In accordance with the base community Relations coordinator and paragraph 1.3.6.5, prepare presentation quality maps.

1.4.11 **Information Repository/Administrative Records.** Submit the Information Repository and Administrative Records in accordance with Air Force Guidance and in concurrance with the COR and the base Community Relations Coordinator. (sequence no. 4, para 6.1)

1.4.12 **Data Management.** The contractor shall meet the data deliverable requirements of the Installation Restoration Program Information Management System (IRPIMS). The contractor shall be responsible for recording field and laboratory data into a computerized format as required by the most current version of the IRPIMS Data Loading Handbook (mailed under separate cover). In order to perform this task, the contractor shall use the IRPIMS Quality Control Tool (QC Tool) and PC software utility (mailed under separate cover with software manual) to quality check ASCII data files and to check all data files for compliance with requirements in the IRPIMS Data Loading Handbook. Upon request, the IRPIMS Contractor Data Loading Tool (CDLT) is available. This PC software is designed to assist the contractor in preparing the various ASCII data files.

Individual IRPIMS data files (e.g., analytical results, groundwater level data, etc.), including resubmissions, shall be delivered with a transmittal letter by the contractor to the Air Force Center for Environmental Excellence (AFCEE) in sequence according to a controlled time schedule as identified in the current version of the IRPIMS Data Loading Handbook. The contractor shall include a copy of the Quality Control Tool error report, i.e., output from the QC tool, for each IRPIMS file submission. The error report shall be submitted both in hard copy and as an electronic file on the submission disks with the filename of the error report identified in the transmittal letter (SEQUENCE No. 3).

All contractor data deliverables shall be sent to:

AFCEE/ESD BLDG 624W
ENVIRONMENTAL RESTORATION DIVISION
ATTN: IRPIMS Data Management
Brooks AFB, TX 78235-5000

In addition, the contractor shall provide a copy of the transmittal letter to the Air Force contracting office responsible for the contract, HSC/PKV (Brooks AFB, TX, 78235-5000) for AFCEE contracts. This letter shall identify the files included or otherwise omitted (with an appropriate explanation), the Government contract and delivery order number, and the Air Force POC that is responsible for monitoring the Government contract.

The contractor shall be responsible for the accuracy and completeness of all data submitted. All data entered into the IRPIMS data files and submitted by the contractor shall correspond exactly with the data contained in the original laboratory reports and other documents associated with sampling and laboratory contractual tasks.

Each file delivered by the contractor will be electronically evaluated by AFCEE/ESD for format compliance and data integrity in order to verify acceptance. All files delivered by the contractor are required to be error-free and in compliance with the IRPIMS Data Loading Handbook. Any errors identified by AFCEE/ESD in the submission shall be corrected by the contractor.

1.4.13 **Decision Document.** The contractor shall prepare and submit DD as described in Section 1.3.11 (SEQUENCE No. 4, para 6.1).

1.4.14 **Technical Reports.** Summarize the findings of the tasks pursuant to the SOW, integrate them with the results of all pertinent previous studies, and formulate conclusions and recommendations for future efforts in Technical Reports.

1.4.14.1. **Remedial Investigation (RI) Report** (para 1.3.3). Provide a RI Report following the format in section 4 of the Handbook (sequence 4, para 6.1).

1.4.14.2. **Risk Assessment (RA) Report** (para 1.3.3.7). Provide a RA Report following the format in section 4 of the Handbook (sequence 4, para 6.1).

1.4.14.3 **Feasibility Study Report** (para 1.3.4). Provide a Feadsibility Study Report foillowing the format in section 4.0 of the Handbook. (sequence 4, para 6.1).

1.4.14.4 **RI/FS Technical Report** (para 1.3.3). Provide a RI/FS Technical Report following the format in section 4.0 of the Handbook. The RI/FS Technical Report shall integrate the RI, RA, and FS reports. Provide two microfiche copies with the final RI/FS Technical Report (sequence 4, para 6.1).

1.4.15 **Basewide Comprehensive IRP Document.** The contractor shall develop a comprehensive document that summarizes both the historic and projected IRP activities. This document shall be used as managment tool to efficiently guide future IRP activities at the DEW Line Sites and Cape Lisburne AFS. The contractor shall follow the outline developed by the AFCEE RTC. Assume two (2) updates (sequence no. 4)

1.4.16 **Analytical Data ITIR.** Prepare and submit the following ITIR's:

a. Development & Screening of Alternatives (para. 1.3.10.1). Submit the results of the development and screening of alternatives in an ITIR prepared in compliance with section 3 of the Handbook (sequence 3, para 6.1)

b. Detailed Screening of Alternatives (para 1.3.10.2).

c. DPM Scoring (para 1.3.9.8). Provide scores, a summary of procedures and assumptions, and Automated DPM output tables for all sites scored with DPM (sequence 3, para 6.1).

d. Mylar[R] Map. Construct Radar Stations' maps of Mylar using guidelines in section 3 of the Handbook. The Maps shall contain all sites and related water and sediment sampling locations (sequence no.3, para. 6.1). The contractor shall create and update digitized map files. Use the digitized data file to produce the Mylar map. The contractor shall print the revision date on the Mylar maps and the date shall be encoded in the digitized data file. Provide a copy of the revised digitized data file to AFCEE-ESO/ER (sequence 1, para. 6.2).

e. Geophysical Survey Contour Map (para 1.3.9.2). Provide a contour map showing geophysical survey results. Interpret the significance of the data in the R&D Status Report (sequence 3, para 6.1).

f. Soil Gas Map (para 1.3.9.5). Provide site maps showing soil gas data superimposed on the sampling locations and incorporate soil gas data generated by the 11 CEOS/CEOR. Interpret the significance of the data in the R&D Status Report (sequence 3, para 6.1).

g. Site Characterization Summary Informal Technical Information Report (SCS ITIR). The contractor shall prepare the report to include the following components:

1. Source identification and contaminant delineation.

2. Identification and ranking of appropriate treatability studies for the listed sites.

3. Data and interpretations integrating the findings of the current study and all previous RI efforts at the sites.

4. Current isoconcentration plots of contaminants detected at each site, lithologic logs of each boring showing contaminants detected and relationship to other borings in the site, and cross-sections of the site showing contaminant distribution.

5. The contents and objectives of a Site Characterization Summary Informal Technical Information Report (ITIR) are specified in the Handbook. The Site Characterization Summary ITIR shall serve as a core document for the RI report. The contractor shall submit an annotated outline of each section of the ITIR for approval by the TPM prior to preparation of the report itself. The contractor shall prepare the report as specified in the accepted annotated outline. The contractor shall submit newly revised portions of the working draft ITIR in order to make available current site characterization data. A prime objective shall be to minimize the volume of comments on the working draft and final submittals by incorporating comments into the report in an on-going manner. The final summary shall contain all sites included in this effort (Sequence No. 4).

h. Weekly Field Activities Report (para 1.3.13). Transmit a Weekly field activities report during field activities pursuant to a format developed by the AFCEE RTC. (Seqence 4, para 6.1)

**II. Site Location and Dates**

Dew Line Sites and Cape Lisburne, date to be established.

**III. Base Support** The base will:

3.1 Provide the contractor with existing engineering plans, drawings, diagrams, aerial photographs, digitized map files, etc., to facilitate evaluation of IRP sites under investigation.

3.2 Arrange for personnel identification badges, vehicles passes, and/or entry permits with the contention the contractor will provide necessary information to the base personnel no less than four weeks before needed.

3.3 Provide the contractor with all previously approved documents which provide information on all IRP efforts conducted at Dew Line Sites and Cape Lisburne and will aid in the determination of the amount of field work and analyses which need to be conducted.

**IV. Government Furnished Property**

See above in section III.

**V. Government Points of Contact:**

**5.1 MAJCOM Coordinator**

Major James R. Williams III
AFCEE/ESRU
8001 Inner Circle DR STE 2
Brooks AFB TX 78235-5328
(210) 536-5243
DSN 240-5243
(210) 536-9026 FAX
DSN 240-9026

**5.2 Restoration Team Chief**

Mr. Michael F. McGhee
AFCEE/ESRU
8001 Inner Circle DR STE 2
Brooks AFB TX 78235-5328
(210) 536-5293
DSN 240-5293
(210) 536-9026 FAX
DSN 240-9026

**5.3 Base Point of Contact (POC)**

Mr. Jim Wolfe
11 CEOS/CEVR
21885 Second Street
Elmendorf AFB AK 99506-4420
(907) 552-4532
DSN 317-552-4532
(907) 552-1533 FAX
DSN 317-552-1533

**5.4 Public Affairs Coordinator**

Ms. Wende Wolf
11 CEOS/DEVR
21885 Second Street
Elmendorf AFB AK 99506-4420
(907) 552-4532
DSN 317-552-4532
(907) 552-1533 FAX
DSN 317-552-1533

# VI. Deliverables

## 6.1 Attachment 1 of the Basic Contract

Sequence numbers 1 and 5 listed in attachment 1 to the basic contract apply to all orders. Guidance for preparing R&D Status Reports (sequence 1) is contained in the Handbook, section 4. In addition, the sequence numbers and dates listed below are applicable to this order:

| Sequence No. | Para No. | Block 10 (freq.) | Block 11 (as of date) | Block 12 (date of 1st. submit.) | Block 13 (date of final report) | Block 14 (no. of copies) |
|---|---|---|---|---|---|---|
| 3 (NETWORK ANALYSIS) | I.1.4.1a | QTRLY | 12APR93 | 30APR93 | a | 4 |
| 4 (WORK PLAN) | I.1.4.1b | ONE/R | 12APR93 | 30MAY93 | 30JULY93 | b |
| 4 (SAP) | I.1.1.4c | ONE/R | 12APR93 | 30MAY93 | 30JULY93 | b |
| 4 (HSP) | I.1.4.1d | OTIME | 12APR93 | 30MAY93 | - | 10 |
| 4 (COMM. REL. PLAN) | I.1.1.4e | ONE/R | 12APR93 | 30MAY93 | 31DEC93 | b |
| 16 (SPECIAL NOTIF.) | I.1.4.2 | OTIME | c | c | - | 3 |
| 9 (PRESNT. MATERIAL) | I.1.4.3 | ASREQ | d | d | - | 10 |
| 18 (MTG. RPTS) | I.1.4.4 | ONE/R | e | e | - | 5 |
| 3 (NEWSLETTER) | I.1.4.5 | QTRLY | 12APR93 | 30NOV93 | a | f |
| 3 (FACT SHEETS) | I.1.4.6 | ASREQ | 12APR93 | 15JUL93 | g | - |
| 3 (PUBLIC NOTICES) | I.1.4.7 | ASREQ | 12APR93 | 15JUL93 | g | h |
| 9 (PHOTO NOTEBOOK) | I.1.4.8 | OTIME | 12APR93 | 15JUL93 | - | 1 |
| 3 (MAILING LIST) | I.1.4.9 | QTRLY | 12APR93 | 15JUL93 | a | - |
| 3 (MAPS) | I.1.4.10 | OTIME | 12APR93 | 15JUL93 | - | 2 |
| 4 INFO REPOS | I.1.4.11 | OTIME | 31JUL93 | - | 31JAN94 | 2 |
| 3 (IRPMS Data ITIR) (Data Management) BCHCON BCHLDI BCHSLI BCHWCI BCHSAMP BCHCALC BCHLTD BCHTEST BCHRES BCHGWD | I.1.4.12 | OTIME | 31JUL93 | 31JAN94 | 31MAR94 | 2 |
| 4 DECISION DOC | I.1.4.13 | ONE/R | i | i | 31OCT94 | b |
| 4 RI REPORT | I.1.4.14.1 | ONE/R | 15SEP93 | 15FEB94 | 30APR94 | b |
| 4 RISK ASSESSMENT | I.1.4.14.2 | ONE/R | 1OCT93 | 16MAY94 | 15JUL94 | b |
| 4 FEASIB. STUDY | I.1.4.14.3 | ONE/R | 30SEPT93 | 30AUG94 | - | b |
| 4 RI/FS Report | I.1.4.14.4 | ONE/R | 30SEP93 | 30SEP94 | 1JAN95 | b |
| 4 IRP DOCUMENT | I.14.15 | ONE/R | 31JUL93 | 31OCT93 | 10DEC93 | b |
| 3 SCREENING ALTER ITIR | I.1.4.16a | OTIME | 30SEP93 | 30DEC93 | - | 10 |
| 3 DETAL ANALYSIS ALTER ITIR | I..1.4.16.b | OTIME | 28 FEB94 | 30MAR94 | - | 10 |
| 1 DPM SCORING | I.1.4.16c | OTIME | 30SEP93 | j | j | 3 |
| 3 MYLAR MAP | I.1.4.16d | OTIME | k | k | - | 5 |
| 3 GEOPHYS CONT | I.1.4.16.e | OTIME | l | l | - | 10 |
| 3 SOIL GAS MAP | I.1.4.16f | OTIME | l | l | - | 10 |
| 4 SCS ITIR | I.1.4.16g | ONE/R | 15SEP93 | 30NOV93 | 15FEB94 | 5 |
| 4 WEEKLY ACT REP | I.1.4.16h | WEEKLY | 13AUG93 | 13AUG93 | - | 1 |

## 6.2 Reserved.

## 6.3 Notes

a. Submit Quarterly Thereafter.

b. One (1) first draft plan (8 copies), one (1) second draft plan (8 copies), and one (1) final plan (10 copies) are required. Incorporate Air Force comments into the second draft and final plan as specified by the RTC. Supply AFCEE/ESR with an advance copy of the first draft, second draft, and

final plan for acceptance prior to distribution. Distribute the remaining copies of each plan as specified by the RTC. The second and final reports shall be submitted within three (3) weeks of receipt of comments from the RTC.

c. Primary and Secondary Documents. One first draft report (25 copies), one second draft report (25 copies), and one final report (35 bound copies plus the original camera-ready copy and a 3.5 inch disk formatted in WordPerfect 5.1 containing the document file) are required. Incorporate Air Force comments into the second draft and final reports as specified by the RTC. Supply the RTC with an advance copy of the first draft, second draft, and final reports for acceptance prior to distribution. Distribute the remaining copies as specified by the RTC .

d. Provide written notice with supporting documentation within three (3) days of telephone notification and at the direction of the RTC. Assume a maximum of 100 pages.

e. Provide within one (1) week of task/meeting completion.

f. Provide 500 copies of the Newsletters and distribute as agreed to by the RTC. This includes mailing the final product to on-base personnel and addresses on the existing mailing list.

g. Provide draft and final deliverables. Provide two advance copies to the AFCEE RTC and to the 11 CEOS Community Relations Coordinator for acceptance prior to preparation of the final deliverables.

h. Provide poster-size map.

i. Submit with the second draft Technical Report

j. Submit with the Technical Report

k. Provide with the Technical Report

l. Provide within four (4) weeks of task completion

**ANNEX-A, TABLE A-1**
**SUMMARY OF ESTIMATED FIELD WORK**
**FOR COST-ESTIMATING PURPOSES ONLY**

| | |
|---|---|
| Estimated Number of Monitor Wells to be Constructed | 5 |
| Estimated Footage of Monitor Wells | 100 |
| Estimated Number of Water Samples for Lab Analysis | 339 |
| Estimated Number of Surface and Subsurface Soil Sampling | 1350 |
| Estimated Number of Soil Samples from Augerings | 1350 |
| Estimated Number of Containerized Waste Samples | 40 |
| Estimated Number of Disposal Water Samples | 5 |
| Estimated Number of Sludge Samples | 5 |
| Estimated Number of Wipe Samples | 3 |
| Estimated Number of Geophysical Surveys | 3 |
| Estimated Total Number of Survey Days | 20 |
| Estimated Number of Soil Gas Survey Days | 20 |

Annex-A, Table A-2
**Analytical METHODS AND ESTIMATED TOTAL NUMBER OF SOIL ANALYSES**
**(for Cost Estimating Purposes Only)**

| | analytical method (a) | Reporting Units | Number of Analyses | Trip Blanks | Amb. Cond Blanks | Equipment Blanks | Dup/Rep | Second Column(b) | Total Analyses |
|---|---|---|---|---|---|---|---|---|---|
| Petroleum Hydrocarbon (Gasoline Range Organics) | SW3050/SW8015 (mod) | mg/Kg | 400 | 20 | 20 | 20 | 40 | | 500 |
| Petroleum Hydrocarbon (Diesel Range Organics) | SW3050/SW8015 (mod) | mg/Kg | 400 | | | 20 | 40 | - | 460 |
| ICP Screen (23 Metals, exclude Boron and Silica) | SW3050/SW6010 | mg/Kg | 100 | - | - | 6 | 10 | - | 116 |
| Arsenic | SW3050/SW7060 | mg/Kg | - | - | | - | - | - | 0 |
| Lead | SW3050/SW7421 | mg/Kg | - | - | - | - | - | - | 0 |
| Mercury | SW7471 | mg/Kg | - | - | | - | - | - | 0 |
| Selenium | SW3050/SW7740 | mg/Kg | - | - | | - | - | - | 0 |
| Organochlorine Pesticides and PCBs | SW3540/SW8080 | mg/Kg | 500 | - | | 20 | 50 | 250 | 820 |
| Volatile Organic Compounds | SW8240 | mg/Kg | 72 | 8 | 8 | 4 | 7 | 36 | 135 |
| Semivolatile Organic Compounds | SW3540/SW8270 | mg/Kg | 100 | - | | 10 | 10 | - | 120 |
| Polynuclear Aromatic Hydrocarbons | SW3540/SW8310 | mg/Kg | - | - | | - | - | - | 0 |
| Volatile Organic Compounds | SW5030/SW8010 | mg/kg | - | - | | - | - | - | 0 |
| Volatile Organic Compounds | SW5030/SW8020 | mg/kg | - | - | | - | - | - | 0 |
| Volatile Organic Compounds | SW5030/SW8260 | mg/kg | - | - | | - | - | - | 0 |
| Total Organic Compounds | SW5030/SW9060 | mg/kg | 88 | - | - | - | 4 | 8 | 100 |
| Cyanide, Total | SW9010 | mg/Kg | - | - | | - | | - | 0 |
| Toxic Characteristic Leaching Procedures (TCLP) | SW1311 | mg/L | 40 | - | - | - | - | - | 40 |
| Soil Moisture Content | ASTM D2216 | Percent (%) | 650 | - | | - | - | - | 650 |
| Soil PH | SW9045 | | 650 | - | - | - | - | - | 650 |
| Sulfer Cleanup/Florisil Cleanup | SW3660/SW3620 | | - | - | - | - | - | - | 0 |
| Gel-Permeation Cleanup | SW3640 | | - | - | - | - | - | - | 0 |
| Total Analyses | | | 3000 | 28 | 28 | 80 | 161 | 294 | 3591 |

**Annex A, TABLE A-3**
**Analytical Methods and Estimated Total Number of Water Analyses**
**(For Cost Estimating Purposes Only)**

| | analytical method (a) | Reporting Units | Number of Analyses | Trip Blanks | Amb Cond Blanks | Equipment Blanks | Dup/Rep | Second Column(b) | Total Analyses |
|---|---|---|---|---|---|---|---|---|---|
| Alkalinity-Carbonate, Bicarbonate, & Hydroxide (field test) | A403 | mg/L | 10 | | | - | 1 | - | 11 |
| Specific Conductance (field test) | E120.1 | mg/L | 10 | | | - | 1 | - | 11 |
| pH (field test) | E150.1 | µmhos/cm | 15 | | | - | 2 | - | 17 |
| Residue, Filterable (Total Dissoloved Solids) | E160.1 | mg/L | 80 | | - | 3 | 8 | - | 91 |
| Non-Filterable Residue (Total Suspended Solids) | E160.2 | mg/L | 80 | | | - | 8 | | 88 |
| Temperature (field test) | E170.1 | deg C | 200 | | - | - | - | - | 200 |
| Common Anions (Chloride, Fluoride, Sulfate) | E325.1 | mg/L | - | - | - | - | - | - | 0 |
| Nitrogen, Nitrate+nitrite | E353.2 | mg/L | - | | - | - | - | - | 0 |
| ICP Screen (23 metals, exclude Boron and Silica) | SW3005/SW6010 | mg/L | 100 | | - | 7 | 25 | - | 132 |
| Arsenic | SW7060 | mg/L | - | | - | - | - | - | 0 |
| Lead | SW3005/SW7421 | mg/L | 100 | | - | 2 | 10 | - | 112 |
| Mercury | SW7470 | mg/L | - | | - | - | - | - | 0 |
| Selenium | SW7740 | mg/L | | | - | - | - | - | 0 |
| Petroleum Hydrocarbons (Gasoline Range Organics) | SW5030/SW8015 (mod.) | mg/L | 150 | 10 | 10 | 5 | 35 | - | 210 |
| Petroleum Hydrocarbons (Diesel Range Organics) | SW5030/SW8015 (mod.) | mg/L | 150 | | | 5 | 35 | - | 190 |
| Purgeable Halocarbons | SW5030/SW8010 | µg/L | 150 | 8 | 8 | 4 | 25 | 75 | 270 |
| Nonhalogenated Volatile Organics | SW5030/SW8015 | µg/L | 150 | 8 | 8 | 4 | 25 | 125 | 320 |
| Purgeable Aromatics | SW5030/SW8020 | µg/L | 150 | 8 | 8 | 4 | 25 | 125 | 320 |
| Organochlorine Pesticides and PCBs | SW3510/SW8080 | µg/L | 166 | - | - | 3 | 17 | 83 | 269 |
| Semivolatile Organic Compounds | SW3510/SW8270 | µg/L | 150 | - | - | 4 | 15 | - | 169 |
| Polynuclear Aromatic Hydrocarbons | SW3510/SW8310 | µg/L | 150 | | - | 4 | 15 | - | 169 |
| Volatile Organic Compounds | SW3510/SW8260 | µg/L | - | | - | - | - | - | 0 |
| Volatile Organic Compounds | SW3510/SW8240 | µg/L | 150 | 8 | 8 | 4 | 25 | 125 | 320 |
| Total Organic Compounds | SW9060 | µg/L | 80 | | | 4 | 10 | | 94 |
| Total Petroleum Hydrocarbon (WTPH-HCID) | E418.1 | mg/L | - | - | - | - | - | - | 0 |
| Sulfur Cleanup/Florisil Column Cleanup | SW3660/SW3620 | - | - | - | | - | - | - | 0 |
| Gel-Permeation Cleanup | SW3640 | - | - | | | - | - | - | 0 |
| COLUMN TOTALS | | | 2041 | 42 | 42 | 53 | 282 | 533 | 2993 |

Notes:

a Unless an abbreviated list of analytes is specified under "Parameter" above, the analytical protocol shall include all analytes listed in the referenced analytical method. The methods cited are from the following sources:

| | |
|---|---|
| "A" Methods | Standard Methods for the Examination of Water and Wastewater, 16th Edition (1985) |
| "E" Methods | Methods for Chemical Analysis of Water and Wastes, EPA Manual, 600/4-79-020 (USEPA, 1983--with additions) |
| "SW" Methods | Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (USEPA, 1986) |
| "ASTM" Methods | American Society for Testing and Materials, 1919 Race treet, Philadelphia, PA 19103 |

b The maximum number of second-column confirmation analyses shall not exceed fifty (50) percent of the actual number of field samples (to include duplicates, replicates, ambient, condition blanks, trip blanks, and equipment blanks). If the number of samples requiring second-column confirmation exceeds this allowance, contact the HSD Technical Project Manager. The total number of samples listed in Tables A-4 and A-5 includes the allowance applicable to each GC method. IF GC/MS, or a combination of second-column GC and GC/MS, is used, the total cost of all such analyses for a particular parameter shall not exceed the funding allowed for positive confirmation using only second-column GC.

REF 68X 68X

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. PAGE 1 OF 2

| 2. PROC INSTRUMENT ID NO. (PIIN) | 3. SPIIN | 4. EFFECTIVE DATE | 5. REQUISITION/PURCHASE REQUEST PROJECT NO. | 6. SCO/DMS RATING |
|---|---|---|---|---|
| F33615-90-D-4010 | 002203 | 94 FEB 15 | FY7624-94-08235 | |

7. ISSUED BY CODE FA8900

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIAL COMMAND
HUMAN SYSTEMS CENTER/PK
8005 9TH STREET
BROOKS AFB, TX 78235-5353
Buyer: EDWIN CUSTODIO/PKVBA
Phone: (210) 536-4493

8. ADMINISTERED BY (IF OTHER THAN BLOCK 7) CODE S2404A

DCMAO, BALTIMORE
ATTN: CHESAPEAKE
200 TOWNSONTOWN BLVD, WEST
TOWNSON MD 21204-5299

9. CONTRACTOR NAME AND ADDRESS CODE 69148 FACILITY CODE

IF "5" FOR MULTIPLE FACILITIES SEE SECT "K"

ICF TECHNOLOGY
9330 LEE HIGHWAY
FAIRFAX VA 22031-1207
COUNTY: FAIRFAX
PHONE: (703) 934-3000

ADVANCE COPY

MAILING ADDRESS;
ICF TECHNOLOGY, INC
ATTN; CYNTHIA L. FALCE
FOUR GATEWAY CENTER 12TH FL.
PITTSBURGH PA 15222

10. SECURITY CLAS U

11. DISCOUNT FOR PROMPT PAYMENT

1 ST % DAYS
2 ND % DAYS
3 RD % DAYS
NET DAYS
OTHER IF "0" SEE SECT "E"

12. PURCHASE OFFICE POINT OF CONTACT
MVH/M6V/MVH

13. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

14. THIS BLOCK APPLIES ONLY TO MODIFICATION OF CONTRACTS

- [ ] THIS CHANGE IS ISSUED PURSUANT TO ______ THE CHANGES SET FORTH HEREIN ARE MADE TO THE ABOVED NUMBERED CONTRACT/ORDER.
- [ ] THE ABOVE NUMBERED CONTRACT IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (SUCH AS CHANGES IN PAYING OFFICE, APPROPRIATION DATA, ETC.) SET FORTH HEREIN.
- [ ] THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF ______ IT MODIFIES THE ABOVE NUMBERED CONTRACT AS SET FORTH HEREIN.
- [X] THIS MODIFICATION IS ISSUED PURSUANT TO FAR52.253-3, CHANGES-TIME&MATLS OR LABOR HRS (AUG87)

15. CONTRACT ADMINISTRATION DATA

| A. KIND OF MOD | B. MOD ABST RECIPIENT ADP PT | C. DATE OF SIGNATURE MODIFICATION | D. CHANGE IN CONTRACT AMOUNT INCREASE (+) DECREASE (-) | E. LOSING PO/CAO ON TRANSFER | F. GAINING PO/CAO ON TRANSFER | G. SVC/AGENCY USE |
|---|---|---|---|---|---|---|
| C | | | $ | | | |

16. ENTER ANY APPLICABLE CHANGES

| A. PAY CODE | B. EFFECTIVE DATE OF AWARD | C. CONTRACT (1) TYPE (2) KIND | D. TYPE CONTR | E. SURV CRIT | F. SPL CONTR PROVISIONS | G. PAYING OFC CODE | H. DATE SIGNED | I. SECURITY (1) CLAS (2) DATE OF DD 254 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

17. REMARKS (Except as provided herein, all items and conditions of the contract, as heretofore changed, remain unchanged and in full force and effect.) SUBJECT: TIME EXTENSION AT NO INCREASE IN CEILING AMOUNT
PROJECT OFFICER: MICHAEL F. MCGHEE, AFCEE/ESR, BROOKS AFB, TX 78235-5328
FINANCE OFFICE: (SC1030) DFAS-COLUMBUS CENTER
ATTN: DFAS-CO/CHESAPEAKE DIV.
P.O.BOX 182264, COLUMBUS OHIO 43218-2264

18. [X] CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT [ ] CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ______ COPIES TO ISSUING OFFICE

19. CONTRACTOR/OFFEROR (Signature of person authorized to sign)
BY

20. NAME AND TITLE OF SIGNER (Type or print)

21. DATE SIGNED

22. UNITED STATES OF AMERICA (Signature of Contracting Officer)
BY Gary J. Macdecy

23. NAME OF CONTRACTING OFFICER (Type or print)
GARY J. MACDECY

24. DATE SIGNED
94 FEB 17

AFMC FORM 702, JUL 92 REPLACES AFSC FORM 702, AUG 84 WHICH IS OBSOLETE

1. Pursuant to the "Changes" Clause of Section I of the basic contract. The performance period and the final delivery schedule are changed from 15 Feb 94 (performance period) and 1 Jan 95 (final delivery schedule date) to 31 Dec 94. The ceiling amount of this delivery order will not be affected by this modification. This modification was generated by request of the contractor with no increase to the ceiling amount. contractor's letter dated 10 Feb 94 is incorporated to this document by reference.

ADVANCE COPY

REF 68X

CONTRACTOR COPY

68X

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. PAGE 1 OF 4

| 2. PROC INSTRUMENT ID NO. (PIIN) | 3. SPIIN | 4. EFFECTIVE DATE | 5. REQUISITION/PURCHASE REQUEST PROJECT NO. | 6. BCC/DMS RATING |
|---|---|---|---|---|
| F33615-90-D-4010 | 002204 | .L DATE | FY7624-94-08663 | |

7. ISSUED BY CODE FA8900

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIEL COMMAND
HUMAN SYSTEMS CENTER/PKVBC
8005 9TH STREET
BROOKS AFB TX 78235-5318
Buyer: BRENDA DILLARD, HSC/PKVBB
Phone: (210) 536-4503

8. ADMINISTERED BY (IF OTHER THAN BLOCK 7) CODE S2404A

DCMAO BALTIMORE
ATTN: CHESAPEAKE
200 TOWSONTOWN BLVD, WEST
TOWSON MD 21204-5299

9. CONTRACTOR NAME AND ADDRESS CODE 69148 FACILITY CODE

ICF TECHNOLOGY
9330 LEE HIGHWAY
FAIRFAX VA 22031-1207

COUNTY: FAIRFAX
PHONE: (703) 934-3000

IF "Y" FOR MULTIPLE FACILITIES SEE SECT "K"

MAIL DATE

AUG 15 1994

10. SECURITY CLAS U

11. DISCOUNT FOR PROMPT PAYMENT NONE

1 ST - DAYS NET DAYS
2 ND - DAYS OTHER IF "Y"
3 RD - DAYS SEE SECT "E"

12. PURCHASE OFFICE POINT OF CONTACT MEC/M5E/MVT

13. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 17. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended by one of the following methods: (a) By signing and returning ______ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

14. THIS BLOCK APPLIES ONLY TO MODIFICATION OF CONTRACTS

☐ THIS CHANGE IS ISSUED PURSUANT TO ______ THE CHANGES SET FORTH HEREIN ARE MADE TO THE ABOVED NUMBERED CONTRACT/ORDER.

☐ THE ABOVE NUMBERED CONTRACT IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (SUCH AS CHANGES IN PAYING OFFICE, APPROPRIATION DATA, ETC.) SET FORTH HEREIN.

☐ THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF ______ IT MODIFIES THE ABOVE NUMBERED CONTRACT AS SET FORTH HEREIN.

☒ THIS MODIFICATION IS ISSUED PURSUANT TO FAR 52.243-3, CHANGES - TIME AND MATERIALS OR LABOR HOU:

15. CONTRACT ADMINISTRATION DATA

| A. KIND OF MOD | B. MOD ABST RECIPIENT ADP PT | C. DATE OF SIGNATURE MODIFICATION | D. CHANGE IN CONTRACT AMOUNT INCREASE (+) DECREASE (-) | E. LOSING PO/CAO ON TRANSFER | F. GAINING PO/CAO ON TRANSFER | G. SVC/AGENCY USE |
|---|---|---|---|---|---|---|
| C | | | $ | | | |

16. ENTER ANY APPLICABLE CHANGES

| A. PAY CODE | B. EFFECTIVE DATE OF AWARD | C. CONTRACT (1) TYPE (2) KIND | D. TYPE CONTR | E. SURV CRIT | F. SPL CONTR PROVISIONS | G. PAYING OFC CODE | H. DATE SIGNED | I. SECURITY (1) CLAS (2) DATE OF DD 254 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

17. REMARKS (Except as provided herein, all items and conditions of the contract, as heretofore changed, remain unchanged and in full force and effect.)

SUBJECT: REVISION TO STATEMENT OF WORK
PROJ MNGR: SAMER N. KARMI, AFCEE/ERDW, 8001 INNER CIRCLE, BROOKS AFB, TX
FINANCE OFFICE: (SC1030)DFAS COLUMBUS CENTER, ATTN: DFAS-CO/CHESAPEAKE DIV
PO BOX 182264, COLUMBUS OH 43218-2264

18. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ______ COPIES TO ISSUING OFFICE

| 19. CONTRACTOR/OFFEROR (Signature of person authorized to sign) BY | | 22. UNITED STATES OF AMERICA (Signature of Contracting Officer) BY William M Watts | |
|---|---|---|---|
| 20. NAME AND TITLE OF SIGNER (Type or print) | 21. DATE SIGNED | 23. NAME OF CONTRACTING OFFICER (Type or print) WILLIAM M. WATTS | 24. DATE SIGNED 15 AUG 94 |

AFMC FORM 702, JUL 92 REPLACES APSC FORM 702, AUG 84 WHICH IS OBSOLETE

1. Pursuant to the "Changes" Clause in Section I of the basic contract, the Statement of Work for Delivery Order 0022, dated 06 Jul 93 is superseded by the revised Statement of Work, dated 17 Jul 94. The subject delivery order ceiling amount is increased by $229,526.00.

2. As a result of paragraph 1 above, the said order is more specifically modified as set forth below:

a. SECTION A - Cover Page - The Not-to-Exceed amount in block 20 (cover page) is increased BY $229,526.00 from $3,299,352.00 to $3,528,878.00."

b. SECTION B - THE SCHEDULE

| Item No | Supplies/Services | | Quantity Purch Unit | Unit Price Total Item Amount |
|---|---|---|---|---|
| 0001 | CLIN Change | sec class: U | 1<br>LO | N<br>N |

noun: SAMPLING, ANALYSIS AND DATA
acrn: XA nsn: N
site codes: pqa: D acp: D fob: D
pr/mipr data: FY7624-94-08202, FY7624-93-08305, FY7624-94-08353, FY7624-94-08235, and FY7624-94-08663
type contract: Y

descriptive data:
Conduct work in accordance with the Statement of Work (SOW) of this order, dated 17 JUL 94 and Section C, The Description/Specifications of the Basic contract. Submit data in accordance with Attachment #1, the Contract Data Requirements List (CDRL) of the basic contract as implemented by paragraph VI of this order's SOW. This modification adds $83,590.00 to the price for CLIN 0001.

| Item No | Supplies/Services | | Quantity Purch Unit | Unit Price Total Item Amount |
|---|---|---|---|---|
| 0002 | CLIN Change | sec class: U | 1<br>LO | N<br>N |

noun: SAMPLING, ANALYSIS AND DATA
acrn: XA nsn: N
site codes: pqa: D acp: D fob: D
pr/mipr data: FY7624-94-08202, FY7624-93-08305, FY7624-94-08353, FY7624-94-08235, and FY7624-94-08663
type contract: Y

descriptive data:
Provide support in accordance with the Statement Work (SOW) of this order, dated 17 JUL 94 and Section C, The Description/Specification of the basic contract. This modification adds $128,148.00 to the price for CLIN 0002.

SECTION B - THE SCHEDULE (Cont'd)

| Item No | Supplies/Services | | Quantity Purch Unit | Unit Price Total Item Amount |
|---|---|---|---|---|
| 0004 | CLIN Change | sec class: U | 1<br>LO | N<br>N |

noun: CHEMICAL ANALYSES
acrn: XA   nsn: N
site codes:   pqa: D   acp: D   fob: D
pr/mipr data: FY7624-94-08353, FY7624-94-08235, and
FY7624-94-08663
type contract: Y

descriptive data:
This modification adds $17,788.00 to the price
for CLIN 0004.

c. SECTION C - Description/Specs - The SOW for this order entitled "Installation Restoration Program Remedial Investigation/Feasibility Study, Distant Early Warning (DEW) Line Sites and Cape Lisburne AFS, AK", dated 17 Jul 94 is attached hereto as Attachment #1 to this modification.

d. SECTION F - Supplies Schedule Data - The delivery schedule is modified as set forth below:

| Item No | Supplies Schedule Data | | Delivery Quantity | Schedule Date |
|---|---|---|---|---|
| 0001 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | sec class: U | 1 | 95APR01 |
| 0002 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | sec class: U | 1 | 95APR01 |
| 0004 | CLIN Del Sch Establish<br>acrn: XA<br>ship to: U | sec class: U | 1 | 95APR01 |

e. SECTION G - Accounting Classification Data:

| ACRN | Acct Class data | Appropriation/Lmt Subhead/CPN Recip DODAAD<br>Supplemental Accounting Classification | | Obligation Amount |
|---|---|---|---|---|
| AC | ACCOUNT ESTABLISH<br>UNCLASSIFIED | 5743400<br>304 7431 434419 040000 53440 000000 674400 | F74400 | $229,526.00+ |
| | pr/mipr data:<br>FY7624-94-08663 | | | |
| XA | SPECIAL ACRN CHANGE<br>UNCLASSIFIED | | | |

descriptive data:
Special ACRN XA funds CLINs 0001, 0002, and 0004 and includes the following:

AA:$ 299,855.00
AB:$ 99,986.00 (mod 0022,01)
:$2,899,511.00 (mod 0022,02)
AC:$ 229,526.00 (mod 0022-04)
TOTAL $3,528,878.00

FINANCE OFFICER: Pay funds in alphabetical order.

3. All other terms and conditions remain unchanged.

1994 JUL 17 ~~1993 JUL 6~~

**STATEMENT OF WORK**
INSTALLATION RESTORATION PROGRAM
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

~~STAGE 1~~

DISTANT EARLY WARNING (DEW) LINE SITES and CAPE LISBURNE AFS, AK

# I. DESCRIPTION OF WORK

## 1.1 Scope

1.1.1 **Background.** The objective of the Air Force Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the National Contingency Plan (NCP) for those sites which pose a threat to human health and welfare or the environment. This objective is achieved through a Remedial Investigation Feasibility Study (RI/FS) process in which conclusions and recommendations drawn from accurate and validated data are used to structure and guide subsequent activities.

The RI/FS process includes scoping to define data requirements and objectives, a remedial investigation to characterize sites for a baseline risk assessment, and a feasibility study to define and evaluate alternative remedial actions so that a recommended action may be selected. Each of these steps of the RI/FS process can be conducted in stages that focus on particular aspects of the process.

The Contractor shall accomplish the actions described in this Statement of Work (SOW) to complete the RI/FS process at the following seven Dew Line Sites and Cape Lisburne:

Barter Island AFS (BAR-M); Bullen Point AFS (POW-3); Point Lonely AFS (POW-1); Point Barrow AFS (POW-M); Point Lay AFS (LIZ-2); Wainwright AFS (LIZ-3); and Oliktok Point AFS (POW-2).

1.1.2 **Requirements for Project Activities.** ~~The Installation Restoration Program (IRP) Handbook referenced in this Statement of Work provides requirements for laboratory and field activities and applicable formats for project documents that shall be used by the Contractor. Volume 1 of the Handbook dated May 1992 is provided under separate cover. This document is referenced in this Statement of Work as the Handbook.~~ The Handbook to Support the Installation Restoration Program (IRP) Statements of Work, dated September 1993, referred to in this SOW as "The Handbook," is provided under separate cover as general guidance only. Any reference within the Handbook language regarding compliance and/or formats for reports as a requirement of this Delivery Order shall be considered deleted. If a conflict is identified between this general guidance and any OSWER, U.S. Environmental Protection Agency (EPA), or other regulatory guidance or requirements, the Handbook shall be disregarded. Also, references to requirements for approval for deviations throughout the Handbook shall be considered invalid. Finally, the Method Detection Limits (MDLs) identified in the Handbook are a consolidation of numerous CFR documents which incorporate current EPA requirements. However, the Contractor shall be responsible for any updates in the CFR. The Contractor is responsible for the thorough knowledge and understanding of the previous findings and recommendations that affect this

task prior to the start of field activities. The documents involved include but are not limited to the IRP Phase I Records Search, and the IRP Phase II plans and reports addressing the Dew Line Sites and Cape Lisburne.

1.1.3 **Meetings.** ~~A maximum of two (2) Contractor personnel, including the project leader, shall attend eight (8) meetings at Elmendorf AFB, AK. Each meeting shall be two (2) 8-hour workdays in duration.~~ All meetings shall be coordinated by the Restoration Team Chief (RTC).

1.1.4 **Special Notifications.** The Contractor shall immediately report to the RTC via telephone, any data or results generated during this investigation which may indicate an imminent health risk. Following this telephone notification, a written notice shall be prepared and delivered within three (3) days. This notification shall include supporting documentation (sequence 16, para 6.1)

## 1.2 Project Scoping Documents

The purpose of the project scoping documents is to clearly and comprehensively define project activities prior to the initiation of field work. The Contractor shall prepare and submit the following project scoping documents for this task prior to the initiation of any field activities, removal actions, or laboratory analyses.

1.2.1 **Engineering Network Analysis.** Provide within ten (10) days after the issuance of an order a computer generated network analysis which is a detailed task plan for the RI/FS work efforts. The network analysis (GANTT) chart shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period of the delivery order. The network analysis (GANTT) shall show both serial and parallel subtasks leading to a deliverable product or report, and shall show early and late start and completion dates with float. The network analysis (GANTT) shall be updated and submitted quarterly (sequence 3, para 6.1).

1.2.2 **Work Plan.** This section will discuss the overall approach, (including a brief summary of the Conceptual Site Model and Data Quality Objectives), major tasks, scope, timeline, and major decision points. Due to the extreme remoteness of the Dew Line Sites and Cape Lisburne, the Contractor shall include a detailed plan for logistics and strategy to complete the RI/FS field activities. Follow the format specified in section 1 of the Handbook. In preparing the Work Plan, use previous reports and the information gathered during the literature search and presurvey along with experience at similar sites. Reevaluate the recommendations for Dew Line Sites and Cape Lisburne developed during previous IRP stages. The Contractor shall also prepare a draft and final addendum to the existing DEW Lines RI/FS work plan. The addendum shall detail the removal activities occurring at Cape Lisburne LRRS pursuant to paragraph I.1.3.14 of this SOW. (sequence 4, para 6.1).

1.2.3 **Sampling and Analysis Plan (SAP).** The SAP consists of a quality assurance plan (QAPP) and a Field Sampling Plan (FSP). Prepare a SAP describing how project activities will be accomplished in the format specified in section 1 of the Handbook. The Contractor shall also prepare a short addendum to this basic SAP which focuses on those sampling and analysis activities undertaken as part of the removal action specified in paragraph I.1.3.14 of this SOW. Incorporate review comments and obtain RTC concurrence prior to the start of field activities (sequence 4, para 6.1).

1.2.4 **Health and Safety Plan (HSP).** Provide a written Health and Safety Plan within eight (8) weeks after the issuance of an order. <u>The Contractor shall also prepare an addendum to the existing DEW Lines RI/FS HSP concerning removal activities conducted pursuant to paragraph 1.1.3.14 of this SOW.</u> The Contractor shall comply with USAF, OSHA, EPA, state, and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for designating the appropriate levels of protection needed at the study sites. The Health and Safety Plan shall provide no less protection than the protection contained in the manual entitled "Health and Safety Requirements for Employees Engaged in Field Activities" dated 1981 and the "Occupational Safety and Health Manual for Hazardous Waste Sites Activities" dated 1985 and 29 CFR 1910. Coordinate the Health and Safety Plan directly with applicable regulatory agencies prior to submittal to AFCEE/ESR. The Contractor shall certify to AFCEE/ESR that the Contractor has reviewed the coordinated Health and Safety Plan with each employee and also subcontractor's employees prior to the time each employee engages in field activities (sequence 4, para 6.1).

1.2.5 **Community Relations Plan.** The Contractor shall prepare a Community Relations Plan (CRP) for the DEW Line Sites and Cape Lisburne AFS outlining the specific public communications and involvement techniques to be used in coordination with remedial site activities (sequence 4, para 6.1). Follow the guidance contained in "Community Relations in Superfund, a Handbook", office of Solid Waste and Emergency Response (OSWER) Directive 9230.0-03C (EPA/540/R-92/009, January 1992, PB92-963341), and other applicable directives. Also, use as a guidance previously accomplished CRP from other installations in Alaska. Appropriately adapt such guidance to the local situation at the DEW Line Sites and Cape Lisburne. As described in OSWER Directive 9230.0-03C, the CRP shall include, but not be limited to, a description of the sites and the community, an overview of the community involvement to date, key community concerns regarding the site and AF site activities, and suggested community relations activities. A contact list of elected officials, agency representatives, and interested groups and individuals shall be included in appropriate copies of the plan. In addition, the plan will include suggested locations for meetings and information repositories. Contractor activities to develop the CRP shall include conducting a review of site information provided by the AF.

1.3 **Project Activities**

The Contractor shall conduct the following tasks to achieve the purposes stated herein, in compliance with approved scoping documents, the Handbook, and all applicable regulations and requirements.

1.3.1 **Community Relations.** Provide support to the base public affairs office for the tasks described below pertaining to the RI/FS Community Relations Program.

1.3.1.1 <u>Public meetings and workshops.</u> The Contractor shall be responsible for coordinating public meetings and workshops for all DEW Line Sites and Cape Lisburne AFS. This includes producing briefing scripts, slides and any associated products such as response cards and sign-in sheets. As requested by the base Community Relations office in coordination with the RTC, research and provide materials for public queries, news media queries, and news releases. Assume a maximum of one (1) workshop/meeting (Seq. nos. 3,9).

1.3.1.2 Public notices. As required by the base Community Relations office and the RTC, the Contractor shall prepare and publish public notices for the Fairbanks and local newspapers. The purpose of these notices is to inform the public of a meeting, workshop, or comment period in which they have the opportunity to be involved in the IRP Program at DEW Line Sites and Cape Lisburne AFS. Also, these notices may be utilized to inform the public of other pertinent program information such as quarterly notices of documents placed in the information repositories. The format for the notices shall be coordinated with the Community Relations office and RTC, and then submitted to the RTC for review prior to delivery to the base. Assume a maximum of two (2) notices (Seq. no. 3).

1.3.1.3 Photo Notebook. The Contractor shall develop a photo notebook which focuses on the overall IRP program at DEW Line Sites and Cape Lisburne AFS. The layout of the notebook will be coordinated with the public affairs office and RTC. Assume a maximum of one (1) update (Seq. no. 9).

1.3.1.4 Mailing List. In coordination with the base Community Relations office and the RTC, prepare and update the mailing list on a quarterly basis. Assume a maximum of two (2) updates (Seq. no. 3).

1.3.1.5 Maps. Prepare presentation quality maps of the installations and their sites to use in newsletters and to distribute to the public.

1.3.1.6 Information Repository/Administrative Record. Prepare a listing of all documents required for the Information Repository and Administrative Record. Create an Information Repository and Administrative Record. The Repository and Record will be maintained by the 11 CEOS/CEVR Community Relations Coordinator. Assume two locations for the Repository and Record, one in Anchorage and another in Elmendorf AFB, AK. Actual locations will be determined by the 11 CEOS/CEVR Community Relations Coordinator.

1.3.2 **Literature Search.** Conduct a literature search and analyze aerial photos of the DEW Line Sties to supplement existing information that has been collected. The purpose of the literature search is to complete the conceptual site model so that a numerical estimate of risk can be developed.

1.3.3 **Presurvey.** Within eight weeks of the issuance of an order, the Contractor shall visit the Dew Line Sites and Cape Lisburne to ensure complete understanding of site conditions. Coordinate this visit with the RTC and the 11 CEOS project manager. The Contractor shall look for evidence of contamination at each site visited (e.g., leaking drums, vegetative stress, leachate seeps). The Contractor shall observe the physical settings of each site visited to formulate specific recommendations concerning boring placement, use of geophysical techniques, and other aspects of the proposed field investigation. The findings of the presurvey shall be used to prepare the Work Plan, SAP, and HSP for the RI and to prepare scoping documents for the treatability study(ies). Assume one presurvey and one reconnaissance trip.

1.3.4 **Quality Assurance/Quality Control (QA/QC).** A QA/QC program shall be conducted and documented for all work pursuant to this delivery order. Contractor and project-specific documents concerning QA/QC procedures and requirements shall be strictly followed. Data generated under the QA/QC program shall be used by the Contractor for evaluating the analytical results and field records assembled for each site to identify accurate and validated data that may be used to assess risk, develop conceptual site models and evaluate alternatives.

1.3.5 **Conceptual Site Model.** Use all available RI/FS data supported by acceptable QA/QC results (as measured against QAPP requirements) and site characterization information to refine, based on newly collected data, the conceptual site model. The model shall define the nature and extent of contamination and the transport and fate of those contaminants. The minimum requirements of the model are given in section 2 of the Handbook. The complexity and detail of the site model shall be consistent with the nature of the site and site problems, and the amount of data available the conceptual site model shall be documented in the Work Plan.

1.3.6 **ARARs Evaluation.** The Contractor shall identify all Applicable or Relevant and Appropriate Requirements (ARAR). These ARARs will be documented in the Work Plan.

1.3.7 **Data Collection, Sampling, and Analysis Procedures.** The Contractor shall conduct field activities, sampling, laboratory analysis, and data quality assessment. Section 2 of the Handbook is recommended for the Contractor to follow. The Contractor shall conduct all activities in accordance with the WP and the SAP approved by the COR. The COR shall be notified in writing of any planned deviation from the activities specified in these documents. COR approval of deviations is required prior to performance. The Contractor shall ensure that all analyses and analytical methods' QA/QC requirements are being met at all times before and during the analysis of samples.

The field investigation (including all drilling and sampling operations) shall be supervised by a registered geologist, hydrogeologist, or professional engineer. If required by the state, the on-site field supervisor shall be certified by the state to install test wells. A detailed log of field conditions, materials penetrated during drilling, well completion, and sampling conditions, as described in Section 2 of the Handbook, shall be maintained and made available for Government inspection upon request. Decisions on well and boring locations, well depths, screened intervals, and all details of the field investigation shall be made by the COR, and the Contractor's field or project supervisor.

1.3.8 **Regulatory Requirements and Permits.** All well drilling, development , sampling, laboratory analysis, and other activities pursuant to this effort shall be conducted in strict accordance with all applicable federal and state laws, ordinances, rules and regulations, and all authorities with jurisdiction over such activities. The Contractor shall complete permits, applications, other documents, and proficiency tests required by the regulatory agencies. The Contractor shall file documents with appropriate agencies and pay all applicable permit and filing fees. The Contractor shall identify locations requiring permits to Radar Station Manager. The Contractor shall include all correspondence in appendices to the technical reports in accordance with Section 4 of the Handbook.

All laboratory analyses shall conform to all applicable federal, state, and local regulatory agency requirements. If the requirements specify that certification is necessary to conduct one or more specific analyses, the Contractor shall furnish documentation showing laboratory certification with the first set of analytical data supplied to AFCEE/ESR and the COR.

The Contractor shall containerize and sample materials suspected to be hazardous in accordance with applicable requirements, Guidance from the Handbook, and the approved Plans. The Contractor shall transport these containerized materials to a location within the installation boundary designated by the Radar Station Manager at a frequency specified by the

Station Manager. The Contractor shall handle, store, and/or dispose of potentially hazardous materials. The Contractor shall transport and empty containerized materials determined not to be hazardous to locations within the installation boundary identified by the Station Manager.

1.3.9 **Remedial Investigation (RI).** The Contractor shall conduct a RI to characterize environmental conditions; define the concentration, nature, and extent of contamination; and quantitatively estimate the risk to human health and the environment and study the area through the collection of geologic and hydrologic data, environmental samples, the laboratory analyses of those samples for potential contaminants, the evaluation of the analytical results and field measurements with respect to quality control data, and the interpretation and analysis of accurate and precise data. The purpose of data collection, sample collection, and laboratory analysis is to determine whether any contaminants generated from installation activities have entered the environment. The field investigation is used to determine the source of any identified contaminants, the magnitude of contamination relative to Applicable or Relevant and Appropriate Requirements (ARARs), and any naturally occurring or background concentrations for specific compounds. The RI shall comply with the specifications, procedures, and methodologies presented in the project-specific SAP. The COR must be notified in writing prior to any modification of or deviation from any activity described in these documents.

1.3.9.1 **Soil Borehole Drilling and Sampling and Well Installation and Sampling.** The Contractor shall drill and collect samples from boreholes as specified in the SAP. The Contractor shall evaluate the need to install, sample, and develop monitoring or extraction wells.

1.3.9.1.1 **Lithologic Samples.** The Contractor shall describe core samples at least every five (5) feet of drilling or at each change in lithology, whichever is less, to indicate significant changes in lithology of characteristic properties that relate to the strata penetrated. Any deviations shall be coordinated with the COR. Guidance for standard identification practices are found in the Handbook. The Contractor shall include in the field logbook observations made by the driller and rig geologist during drilling such as depth to water, penetration rate, drill rig behavior, and other observations that might be indicative of changes in formation characteristics. The Contractor shall record depth to permafrost in all the soil borings and shall not proceed beyond five (5) feet into the permafrost layer.

1.3.9.1.2 **Drill Cuttings and Drilling Fluids.** The Contractor shall containerize all drill cuttings and drilling fluids. All drill cuttings and drilling fluids shall be managed and disposed of in accordance with the project SAP. (Note: The Contractor shall be responsible for providing all necessary containers.) The Contractor shall be responsible for the logistics of the ultimate disposal of all drill fluids or drill cuttings deemed hazardous in accordance with current EPA off-site disposal policy and state and/or local hazardous waste disposal laws. The contractor shall coordinate with the Station Manager for on-site placement and disposal of all drill cuttings, fluids, purge fluid, and excavated material. If on-site disposal is excluded, all hazardous waste shall be transported by a permitted hazardous waste transporter to a licensed Resource Conservation and Recovery Act (RCRA) approved facility and be accompanied by a Uniform Hazardous Waste Manifest. The Contractor shall provide a final, completed copy of the hazardous waste manifest to the 11 CEOS/CEVR. The Radar Stations' hazardous waste managers will sign all hazardous waste manifest documents.

1.3.9.1.3 **Well/Boring Precautions.** The Contractor shall mark the field locations of all borings during the planning/mobilization phase of the field investigation. The Contractor shall consult with base personnel to minimize the disruption of base activities, to properly position wells with respect to site locations, and to avoid penetrating underground utilities. The Contractor shall obtain all permits prior to commencement of digging and drilling operations. The Contractor shall utilize a registered land surveyor in determining the elevations and locations of all off-base background study borings. All borings and wells from which samples are taken shall be surveyed by the Contractor for vertical and horizontal control. The Contractor shall record the positions on project and site specific maps. Bench marks used must have been previously established from and be traceable to a U. S. Coast and Geodetic Survey (USCGS) or U. S. Geological Survey (USGS) survey marker. Clearly identify all bench mark locations on the base map.

1.3.9.1.4 **Water-Level Measurements in Boreholes.** The Contractor shall measure water levels in all boreholes after the water level has stabilized. Include this information and the date of measurement in the boring logs. Also, record soil moisture conditions (moist, wet, saturated, etc.) in the boring log.

1.3.9.1.5 **Air Monitoring During Drilling.** The Contractor shall monitor the ambient air in the breathing zone above the borehole during all drilling with an appropriate organic vapor analyzer to identify potentially hazardous and/or toxic vapors. Include air monitoring results in borehole logs.

1.3.9.1.6 **Subsurface Soil Sampling.** The Contractor shall collect soil samples from borings as specified in the SAP. The SAP specifies the analytical methods, the parameters for analysis, and the estimated number of analyses for soil samples.

1.3.9.1.7 **Well Construction Requirements.** The Contractor shall coordinate with the COR to determine well completion requirements (flush or projected above ground surface). All wells shall be secured as soon as possible after drilling. The Contractor shall provide corrosion resistant locks for both flush and above-ground well assemblies. The locks shall be compatible with existing wells. The Contractor shall turn the lock keys over to 11 CEOS/CEVR POC following completion of the field effort. The Contractor shall coordinate with the 11 CEOS/CEVR POC, the RTC, and the COR the selection of exact well and screen placement, gravel pack design, and screen slot size.

1.3.9.1.8 **Well Logs.** For each well, the Contractor shall prepare a well completion log and schematic diagram showing well construction details. Lithologic descriptions, well elevation survey data, and other information included in the well logs shall conform to the specifications of the SAP.

1.3.9.1.9 **Well Development.** The contractor shall develop each well as soon as possible. Guidance for well development procedures are found in the Handbook. The Contractor shall measure the rate of water production, pH, specific conductance, and water temperature during well development.

1.3.9.1.10 **Well Placement.** The Contractor shall avoid installing wells in depressions or areas subject to frequent flooding and/or standing water. If wells must be installed in such areas, the Contractor shall design the wells so standing water does not leak into the top of the casing or cascade down the annular space.

1.3.9.1.11 **Well and Borehole Clean-up.** The Contractor shall clean the area following the completion of each well and borehole. The Contractor shall return all sites to the original condition of the site.

1.3.9.1.12 **Groundwater and Surface Water Sampling.** The Contractor shall collect groundwater and Surface Water samples from newly developed well and existing wells and from surface water bodies. The SAP shall specify the analytical methods, the parameters for analysis, and the estimated number of analyses for groundwater and surface water samples.

1.3.9.1.13 **Composite Sampling.** The Contractor shall collect and analyze drill cuttings, fluids, purge fluids, and excavated material. The SAP shall specify the analytical methods, the parameters for analysis, and the estimated number of analyses for composite samples.

1.3.9.2 **Geophysical Surveys.** The Contractor shall evaluate whether geophysical surveys are needed (e.g., to determine boundaries of landfills, to locate underground debris, utilities and storage tanks). Where geophysical surveys are appropriate, the Contractor shall select a geophysical survey technique or techniques [such as ground penetrating radar (GPR), magnetometer or electromagnetic surveys (EM)] that will best meet the desired application. The technique(s) used shall be approved by the RTC prior to use. Approximate number of surveying days is included in Annex A which is to be used for costing purposes only. Appropriate grid systems shall be established and the Contractor shall use the results of this survey to prepare a contour map of the results. Provide this map as an attachment to the first R&D Status Report submitted after the completion of the geophysical surveys. The Contractor shall perform the geophysical surveys before drilling and use the results in selecting the location of soil borings, wells, test pits, if necessary.

1.3.9.3 **Permeability Testing.** The Contractor shall determine the need for a permeability test at Cape Lisburne AFS, to provide additional data on the hydrogeologic characteristics of the water table aquifer. The SAP shall specify the method to be used for the permeability test.

1.3.9.4 **Water Level Measurement.** The Contractor shall evaluate the need for conducting a complete round of water level measurements in all existing and new wells at Cape Lisburne AFS at the beginning of field work and during the field sampling effort. Data gathered shall be used for interpreting groundwater flow directions and groundwater gradient.

1.3.9.5 **Soil Gas Surveys.** The Contractor shall evaluate the need for soil gas surveys and Hydropunch (e.g., to select soil boring locations). If soil gas surveys and hydropunch are included as part of the approved Work Plan and FSP, the Contractor shall establish appropriate grid systems. The Contractor shall prepare a posting map of soil gas values relative to their location on the grid used. Provide this map as an attachment to the first R&D Status Report submitted after completion of the soil gas survey (sequence 3, para 6.1). Approximate number of surveying days are included in Annex A which is to be used for costing purposes only.

1.3.9.6 **Groundwater Field Screening.** The Contractor shall perform groundwater field screening. The SAP shall specify the method, location, and type of groundwater field screening.

1.3.9.7 **Baseline Risk Assessment.** The Contractor shall use data supported by acceptable QA/QC results (as measured against QAPP requirements) and the conceptual site model to numerically estimate the risk posed by site contaminants to human health and the environment. The Contractor shall identify and list all ARARs for those contaminants detected in environmental

samples at the site. The Contractor shall provide all ARARs evaluations as an attachment to the Technical Report. Provide the results of the baseline risk assessment in the Technical Report using the formats in Section 4 of the Handbook as a guidance.

The Contractor shall identify those sites posing minimal or no threat to human health, welfare, or the environment and for which no further action is appropriate.

The Contractor shall use the results of the risk assessment in establishing remedial action objectives and developing remedial alternatives in the Feasibility Study.

1.3.9.8 **Defense Priority Model Scores.** The Contractor shall use the Defense Priority Model to score the sites. The score shall be included as an appendix to the RI/FS Technical Report.

1.3.9.9 **Fate and Transport.** The Contractor shall perform fate and transport modeling for contaminants of interest to include the projection of future contaminant concentrations within the boundaries of the site. This will be done in conjunction with the RI/FS report.

1.3.10 **Feasibility Study (FS).** The Contractor shall perform a FS concurrently with the RI. As much of the FS as possible shall be performed early in the RI/FS process and refined as additional RI data are obtained. The Contractor shall use the information from the RI and the baseline risk assessment to develop and evaluate remedial action alternatives for each site where a threat to human health or the environment exists. The Contractor shall follow the procedures specified in USEPA OSWER Directive 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." The Contractor shall employ streamlining methods wherever possible and develop and evaluate the minimum number of alternatives needed to provide a range of promising treatment and containment actions. The Contractor shall eliminate impracticable alternatives from further consideration early in the FS process. The scope and level of detail shall be consistent with the nature and complexity of site problems.

1.3.10.1 **Develop and Screen Alternatives.** The Contractor shall establish remedial action objectives and remediation goals for protecting human health and the environment. These objectives and goals shall be determined based on identified ARARs and acceptable exposure levels as defined in the baseline risk assessment and refined throughout the RI/FS process. Identify general response actions and applicable technologies based on site and contaminant conditions, and combine technologies to formulate distinct alternatives. The Contractor shall develop alternatives which eliminate, control, and /or reduce risk to human health or the environment to acceptable levels for each pathway. Where a wide variety of promising alternatives exists, the Contractor shall screen the alternatives based on effectiveness, implementability, and cost. The Contractor shall detail the development and screening of the alternatives process and identify the alternatives selected for detailed analysis in the Informal Technical Information Report (ITIR).

1.3.10.2 **Detailed Screening of Alternatives.** The Contractor shall conduct a detailed analysis on each alternative selected and identified in the above step and approved by the COR. Using the methodology in OSWER Directive 9355.3-01, the Contractor shall evaluate each alternative against the nine criteria. In addition to the individual assessment, the Contractor shall perform a comparative analysis to determine the relative performance of alternatives. The Contractor shall focus the analysis on sub-factors and criteria most pertinent to each site and the scope and complexity of the

proposed action. Provide a summary of the Detailed Analysis of Alternatives in the R&D report submitted following task completion. Include summary tables of the individual and comparative analyses that will be used in the Technical Report.

1.3.11 **Decision Documents.** The Contractor shall prepare and submit Decision Documents (DD) following the Handbook Section 4.4 as guidance. The purpose of the DD is to support a remedial action alternative or a no further action alternative. The Contractor shall submit an Interim Decision Document detailing the removal action process, results and conclusions.

1.3.12 **Site Specific Requirements.** The Contractor shall perform the requirements listed in this SOW in conformance with the guidance of the Handbook, requirements of the approved WP, and the SAP. Annex A specifies the proposed values for field and laboratory activities to be conducted, specifications for field activities, information for sediment and soil samples, analytical methods, parameters for analysis, estimated number of analyses for water/sediment/soil samples, required analytical methods, estimated number of analyses for all core samples, estimated number soil gas analyses for each parameter, and field QC sample requirements for soil and water samples for costing purposes only.

1.3.13 **Weekly Field Activity Report**

The contractor shall transmit a Weekly field activity report. The reports shall include, but not be limited to, all field work detailed in this SOW, a listing of any problems encountered (e.g., equipment problems, equipment downtime), and actions taken to resolve those problems. ~~The AFCEE RTC shall develop the format for the report.~~

1.3.14 **Removal Actions**

The Contractor shall complete the following tasks to remove or otherwise control source contamination and further characterize site conditions at Cape Lisburne LRRS. The Contractor shall include any data generated during these activities in the pertinent reports.

1.3.14.1 **Task 1** involves placement of an interceptor trench (French drain) below Petroleum, Oil, and Lubricant (POL) Tanks 1 and 2 to capture spilled or leaked petroleum products which are currently migrating through the subsurface toward a nearby surface water body. Collected material shall drain to a sump for separation into its water and petroleum components. Accumulated water shall be treated using granulated activated carbon or appropriate vapor control technology, chemically analyzed for the presence of remaining contaminants, and subsequently, in coordination with Alaska Department of Environmental Conservation (ADEC), disposed of according to all applicable water regulations. Recovered petroleum product will be incinerated on-site, after coordination ADEC. Soils excavated to accommodate the trench may be returned to the surrounding land, provided that they are not considered hazardous under the RCRA "contained-in" policy. Soils which are deemed hazardous may be drummed and sent for off-site disposal according to applicable hazardous waste regulations, or may be stored on-site pending subsequent remedial activities.

1.3.14.2 **Task 2** requires the removal and off-site disposal of a sludge pile located at Landfill and Waste Accumulation Area Number 1. Using a backhoe provided by the base, the sludge pile shall be excavated.

containerized in 55-gallon drums, and transported to a disposal facility in the continental U.S. A temporary drum staging area shall be established nearby to store the drums until they are transported. Current plans may involve shipment of waste on the barge's return trip to Cape Lisburne. Prior to field operations on this task, a representative sample of the sludge must be collected and analyzed using TCLP and other characteristic methods to determine if the material is a hazardous waste. The sludge must be managed and disposed of according to the results of such analyses. After removal of the sludge, the excavated area must also be sampled and analyzed to detect any constituents remaining at the site.

1.3.14.3 **Task** 3 involves limited PCB sampling and analysis. The purpose of this task is twofold: to further characterize contamination in ocean sediments adjacent to Landfill and Waste Accumulation Area Number 1, and to locate a reported "hot spot" undiscovered during the 1993 RI/FS sampling program.

## 1.4 Project Deliverables

Deliver the following documents in compliance with the requirements of item VI, the formats required in section 1 and 4 of the Handbook, and the specifications noted below. Draft reports are considered "drafts" only because they have not been reviewed and approved by the Air Force. In all other respects, "drafts" shall be complete, in the proper format, fully illustrated, and free of grammatical and typographical errors.

### 1.4.1 Scoping Documents.

a. Engineering Network Analysis (GANTT) (para 1.2.1). Provide within ten (10) days after the issuance of an order. Update and submit quarterly (sequence 3, para 6.1).

b. Work Plan (para 1.2.2). Use the format in section 1 of the Handbook (sequence 4, para 6.1).

c. Sampling and Analysis Plan (1.2.3). Use the format in section 1 of the Handbook (sequence 4, para 6.1).

d. Health and Safety Plan (para 1.2.4). Provide within six (6) weeks after the issuance of an order (sequence 4, para 6.1).

e. Community Relations Plan (para 1.2.5). Provide within eight (8) weeks after issuance of an order (sequence 4, para 6.1).

1.4.2 **Special Notification.** Provide written notification of imminent health hazards and supporting documentation within three (3) days of telephone notification (sequence 16, para 6.1).

1.4.3 **Presentation Materials.** The Contractor shall prepare and present up to two (2) presentation packages at meetings coordinated by the Air Force (sequence 9, para 6.1). Attendance of these meetings is included in paragraph 1.1.3 of this SOW. As part of the presentation materials, the Contractor shall provide paper copies of all slides and overheads.

1.4.4 **Meeting Summaries** (para 1.1.3). Provide no later than five (5) days after conclusion of each meeting (sequence 18, para 6.1).

1.4.5 **Newsletter.** Prepare and submit a quarterly newsletter which presents the status of the entire base IRP Program. This will include preparing an outline resulting from input by all Contractors involved in the program. The outline must be approved by the base and RTC prior to submittal of the newsletter. The final product will be printed and distributed as agreed to by the RTC. Assume a maximum of two (2) newsletters (Sequence no. 3).

1.4.6 **Fact Sheets.** As required by the base IRP Program, prepare and submit fact sheets which facilitate the public's understanding of the IRP Program. These sheets should include key community concerns regarding sites as specified by the base. Use the format agreed to by the base and RTC. Print and distribute the fact sheets as agreed to by the RTC. Assume a maximum of two (2) fact sheets (Sequence no. 3).

1.4.7 **Public Notices.** In accordance with paragraph 1.3.6.2, prepare and submit public notices for the Fairbanks and local newspapers. Use the format agreed to by the base and RTC (Sequence no. 3).

1.4.8 **Photo Notebook.** In accordance with paragraph 1.3.6.3, develop a photo notebook which focuses on the overall base IRP Program. The Contractor shall include photos of sites under investigation, field and removal activities, and sample locations. Photos shall reflect proper sampling techniques, QA/QC procedures, and Health and Safety reports during field activities. Prior to implementation, submit a conceptual layout of the notebook for review by the base and RTC (Sequence no. 9).

1.4.9 **Mailing List.** In accordance with the base Community Relations coordinator and paragraph 1.3.6.4, update the existing mailing list on a quarterly basis (Sequence no. 3).

1.4.10 **Maps.** In accordance with the base community Relations coordinator and paragraph 1.3.6.5, prepare presentation quality maps.

1.4.11 **Information Repository/Administrative Records.** Submit the Information Repository and Administrative Records in accordance with Air Force Guidance and in concurrence with the COR and the base Community Relations Coordinator. (sequence no. 4, para 6.1)

1.4.12 **Data Management.** The Contractor shall meet the data deliverable requirements of the Installation Restoration Program Information Management System (IRPIMS). The Contractor shall be responsible for recording field and laboratory data into a computerized format as required by the most current version of the IRPIMS Data Loading Handbook (mailed under separate cover). In order to perform this task, the Contractor shall use the IRPIMS Quality Control Tool (QC Tool) and PC software utility (mailed under separate cover with software manual) to quality check ASCII data files and to check all data files for compliance with requirements in the IRPIMS Data Loading Handbook. Upon request, the IRPIMS Contractor Data Loading Tool (CDLT) is available. This PC software is designed to assist the Contractor in preparing the various ASCII data files.

Individual IRPIMS data files (e.g., analytical results, groundwater level data, etc.), including resubmissions, shall be delivered with a transmittal letter by the Contractor to the Air Force Center for Environmental Excellence (AFCEE) in sequence according to a controlled time schedule as identified in the current version of the IRPIMS Data Loading Handbook. The Contractor shall include a copy of the Quality Control Tool error report, i.e., output from the QC tool, for each IRPIMS file submission. The error report shall be

submitted both in hard copy and as an electronic file on the submission disks with the filename of the error report identified in the transmittal letter (SEQUENCE No. 3).

All Contractor data deliverables shall be sent to:

AFCEE/ESD BLDG 624W
ENVIRONMENTAL RESTORATION DIVISION
ATTN: IRPIMS Data Management
Brooks AFB, TX 78235-5000

In addition, the Contractor shall provide a copy of the transmittal letter to the Air Force contracting office responsible for the contract, HSC/PKV (Brooks AFB, TX, 78235-5000) for AFCEE contracts. This letter shall identify the files included or otherwise omitted (with an appropriate explanation), the Government contract and delivery order number, and the Air Force POC that is responsible for monitoring the Government contract.

The Contractor shall be responsible for the accuracy and completeness of all data submitted. All data entered into the IRPIMS data files and submitted by the Contractor shall correspond exactly with the data contained in the original laboratory reports and other documents associated with sampling and laboratory contractual tasks.

Each file delivered by the Contractor will be electronically evaluated by AFCEE/ESD for format compliance and data integrity in order to verify acceptance. All files delivered by the Contractor are required to be error-free and in compliance with the IRPIMS Data Loading Handbook. Any errors identified by AFCEE/ESD in the submission shall be corrected by the Contractor.

1.4.13 **Decision Document.** The Contractor shall prepare and submit DD as described in Section 1.3.11 (SEQUENCE No. 4, para 6.1).

1.4.14 **Technical Reports**. Summarize the findings of the tasks pursuant to the SOW, integrate them with the results of all pertinent previous studies, and formulate conclusions and recommendations for future efforts in Technical Reports.

1.4.14.1. **Remedial Investigation (RI) Report** (para 1.3.3). Provide a RI Report following the format in section 4 of the Handbook (sequence 4, para 6.1).

1.4.14.2. **Risk Assessment (RA) Report** (para 1.3.3.7). Provide a RA Report following the format in section 4 of the Handbook (sequence 4, para 6.1).

1.4.14.3 **Feasibility Study Report** (para 1.3.4). Provide a Feasibility Study Report following the format in section 4.0 of the Handbook. (sequence 4, para 6.1).

1.4.14.4 **RI/FS Technical Report** (para 1.3.3). Provide a RI/FS Technical Report following the format in section 4.0 of the Handbook. The RI/FS Technical Report shall integrate the RI, RA, and FS reports. Provide two microfiche copies with the final RI/FS Technical Report (sequence 4, para 6.1).

1.4.15 **Basewide Comprehensive IRP Document.** The Contractor shall develop a comprehensive document that summarizes both the historic and projected IRP activities. This document shall be used as management tool to efficiently guide future IRP activities at the DEW Line Sites and Cape Lisburne AFS. The Contractor shall follow the outline developed by the AFCEE RTC. Assume two (2) updates (sequence no. 4)

1.4.16 **Analytical Data ITIR.** Prepare and submit the following ITIRs, as well as the Analytical Data ITIR itself:

a. Development & Screening of Alternatives (para. 1.3.10.1). Submit the results of the development and screening of alternatives in an ITIR prepared in compliance with section 3 of the Handbook (sequence 3, para 6.1)

b. Detailed Screening of Alternatives (para 1.3.10.2).

c. DPM Scoring (para 1.3.9.8). Provide scores, a summary of procedures and assumptions, and Automated DPM output tables for all sites scored with DPM (sequence 3, para 6.1).

d. Mylar® Map. Construct Radar Stations' maps of Mylar using guidelines in section 3 of the Handbook. The Maps shall contain all sites and related water and sediment sampling locations (sequence no. 3, para. 6.1). The Contractor shall create and update digitized map files. Use the digitized data file to produce the Mylar map. The Contractor shall print the revision date on the Mylar maps and the date shall be encoded in the digitized data file. Provide a copy of the revised digitized data file to AFCEE-ESO/ER (sequence 1, para. 6.2).

e. Geophysical Survey Contour Map (para 1.3.9.2). Provide a contour map showing geophysical survey results. Interpret the significance of the data in the R&D Status Report (sequence 3, para 6.1).

f. Soil Gas Map (para 1.3.9.5). Provide site maps showing soil gas data superimposed on the sampling locations and incorporate soil gas data generated by the 11 CEOS/CEOR. Interpret the significance of the data in the R&D Status Report (sequence 3, para 6.1).

g. Site Characterization Summary Informal Technical Information Report (SCS ITIR). The Contractor shall prepare the report to include the following components:

1. Source identification and contaminant delineation.

2. Identification and ranking of appropriate treatability studies for the listed sites.

3. Data and interpretations integrating the findings of the current study and all previous RI efforts at the sites.

4. Current isoconcentration plots of contaminants detected at each site, lithologic logs of each boring showing contaminants detected and relationship to other borings in the site, and cross-sections of the site showing contaminant distribution.

5. The contents and objectives of a Site Characterization Summary Informal Technical Information Report (ITIR) are specified in the Handbook. The Site Characterization Summary ITIR shall serve as a core document for the RI report. The Contractor shall submit an annotated outline of each section of the

ITIR for approval by the TPM prior to preparation of the report itself. The Contractor shall prepare the report as specified in the accepted annotated outline. The Contractor shall submit newly revised portions of the working draft ITIR in order to make available current site characterization data. A prime objective shall be to minimize the volume of comments on the working draft and final submittals by incorporating comments into the report in an on-going manner. The final summary shall contain all sites included in this effort (Sequence No. 4).

h. Weekly Field Activities Report (para 1.3.13). Transmit a Weekly field activities report during field activities pursuant to a format developed by the AFCEE RTC. (Sequence no. 4, para 6.1)

**II. Site Location and Dates**

Dew Line Sites and Cape Lisburne, date to be established.

**III. Base Support** The base will:

3.1 Provide the Contractor with existing engineering plans, drawings, diagrams, aerial photographs, digitized map files, etc., to facilitate evaluation of IRP sites under investigation.

3.2 Arrange for personnel identification badges, vehicles passes, and/or entry permits with the contention the Contractor will provide necessary information to the base personnel no less than four weeks before needed.

3.3 Provide the Contractor with all previously approved documents which provide information on all IRP efforts conducted at Dew Line Sites and Cape Lisburne and will aid in the determination of the amount of field work and analyses which need to be conducted.

**IV. Government Furnished Property**
Not Applicable

V. Government Points of Contact:

~~5.1 MAJCOM Coordinator~~

~~Major James R. Williams III~~
~~AFCEE/ERD~~
~~8001 Inner Circle DR STE 2~~
~~Brooks AFB TX 78235-5328~~
~~(210) 536-5243~~
~~DSN 240-5243~~
~~(210) 536-9026 FAX~~
~~DSN 240-9026~~

~~5.2 Restoration Team Chief~~

~~Mr. Michael F. McGhee~~
~~AFCEE/ERD~~
~~8001 Inner Circle DR STE 2~~
~~Brooks AFB TX 78235-5328~~
~~(210) 536-5293~~
~~DSN 240-5293~~
~~(210) 536-9026 FAX~~
~~DSN 240-9026~~

~~5.3 Base Point of Contact (POC)~~

~~Mr. Jim Wolfe~~
~~11 CEOS/CEVR~~
~~21885 Second Street~~
~~Elmendorf AFB AK 99506-4420~~
~~(907) 552-4532~~
~~DSN 317-552-4532~~
~~(907) 552-1533 FAX~~
~~DSN 317-552-1533~~

~~5.4 Public Affairs Coordinator~~

~~Ms. Wende Wolf~~
~~11 CEOS/DEVR~~
~~21885 Second Street~~
~~Elmendorf AFB AK 99506-4420~~
~~(907) 552-4532~~
~~DSN 317-552-4532~~
~~(907) 552-1533 FAX~~
~~DSN 317-552-1533~~

## VI. Deliverables

### 6.1 Attachment 1 of the Basic Contract

Sequence numbers 1 and 5 listed in attachment 1 to the basic contract apply to all orders. Guidance for preparing R&D Status Reports (sequence 1) is contained in the Handbook, section 4. In addition, the sequence numbers and dates listed below are applicable to this order:

| Sequence No. | Para No. | Block 10 (freq.) | Block 11 (as of date) | Block 12 (date of 1st. submit.) | Block 13 (date of final report) | Block 14 (no. of copies) |
|---|---|---|---|---|---|---|
| 3 (NETWORK ANALYSIS) | 1.1.4.1a | QTRLY | 12APR93 | 30APR93 | a | 4 |
| 4 (WORK PLAN) | 1.1.4.1b | ONE/R | 12APR93 | 30MAY93 | 30JULY93 | b |
| 4 (WORK PLAN ADDENDUM) | 1.1.4.1b | ONE/R | | 2WKSDOA | 15SEPT94 | m |
| 4 (SAP) | 1.1.1.4c | ONE/R | 12APR93 | 30MAY93 | 30JULY93 | b |
| 4 (SAP ADDENDUM) | 1.1.4.1c | ONE/R | | 3WKSDOA | 15SEPT94 | n |
| 4 (HSP) | 1.1.4.1d | OTIME | 12APR93 | 30MAY93 | - | 10 |
| 4 (HSP ADDENDUM) | 1.1.4.1d | OTIME | | 2WKSDOA | | 5 |
| 4 (COMM. REL. PLAN) | 1.1.1.4e | ONE/R | 12APR93 | 30MAY93 | 31DEC93 | b |
| 16 (SPECIAL NOTIF.) | 1.1.4.2 | OTIME | c | c | - | 3 |
| 9 (PRESNT. MATERIAL) | 1.1.4.3 | ASREQ | d | d | - | 10 |
| 18 (MTG. RPTS) | 1.1.4.4 | ONE/R | e | e | - | 5 |
| 3 (NEWSLETTER) | 1.1.4.5 | QTRLY | 12APR93 | 30NOV93 | a | f |
| 3 (FACT SHEETS) | 1.1.4.6 | ASREQ | 12APR93 | 15JUL93 | g | - |
| 3 (PUBLIC NOTICES) | 1.1.4.7 | ASREQ | 12APR93 | 15JUL93 | g | h |
| 9 (PHOTO NOTEBOOK) | 1.1.4.8 | OTIME | 12APR93 | 15JUL93 | - | 1 |
| 3 (MAILING LIST) | 1.1.4.9 | QTRLY | 12APR93 | 15JUL93 | a | - |
| 3 (MAPS) | 1.1.4.10 | OTIME | 12APR93 | 15JUL93 | - | 2 |
| 4 INFO REPOS | 1.1.4.11 | OTIME | 31JUL93 | - | 31JAN94 | 2 |
| 3 (IRPMS Data ITIR) (Data Management) BCHCON BCHLDI BCHSLI BCHWCI BCHSAMP BCHCALC BCHLTD BCHTEST BCHRES BCHGWD | 1.1.4.12 | OTIME | 31JUL93 | 31JAN94 | 31MAR94 | 2 |
| 4 DECISION DOC | 1.1.4.13 | ONE/R | i | i | 31OCT94 | b |
| 4 RI REPORT | 1.1.4.14.1 | ONE/R | 15SEP93 | 15FEB94 | 30APR94 | b |
| 4 RISK ASSESSMENT | 1.1.4.14.2 | ONE/R | 1OCT93 | 16MAY94 | 15JUL94 | b |
| 4 FEASIB. STUDY | 1.1.4.14.3 | ONE/R | 30SEPT93 | 30AUG94 | - | b |
| 4 RI/FS Report | 1.1.4.14.4 | ONE/R | 30SEP93 | 30SEP94 | 1JAN95 | b |
| 4 IRP DOCUMENT | 1.14.15 | ONE/R | 31JUL93 | 31OCT93 | 10DEC93 | b |
| 3 ANALYTICAL DATA ITIR | | OTIME | | 01DEC94 | | 2 |
| 3 SCREENING ALTER ITIR | 1.1.4.16a | OTIME | 30SEP93 | 30DEC93 | - | 10 |
| 3 DETAL ANALYSIS ALTER ITIR | 1..1.4.16.b | OTIME | 28 FEB94 | 30MAR94 | - | 10 |
| 1 DPM SCORING | 1.1.4.16c | OTIME | 30SEP93 | j | j | 3 |
| 3 MYLAR MAP | 1.1.4.16d | OTIME | k | k | - | 5 |
| 3 GEOPHYS CONT | 1.1.4.16.e | OTIME | l | l | - | 10 |
| 3 SOIL GAS MAP | 1.1.4.16f | OTIME | l | l | - | 10 |
| 4 SCS ITIR | 1.1.4.16g | ONE/R | - | 01FEB95 | 01APR95 | o |
| ~~4 SCS ITIR~~ | ~~1.1.4.16g~~ | ~~ONE/R~~ | ~~15SEP93~~ | ~~30NOV93~~ | ~~15FEB94~~ | 5 |
| 4 WEEKLY ACT REP | 1.1.4.16h | WEEKLY | 13AUG93 | 13AUG93 | - | 1 |

### 6.2 Reserved.

**6.3 Notes**

a. Submit Quarterly Thereafter.

b. One (1) first draft plan (8 copies), one (1) second draft plan (8 copies), and one (1) final plan (10 copies) are required. Incorporate Air Force comments into the second draft and final plan as specified by the RTC. Supply AFCEE/ESR with an advance copy of the first draft, second draft, and final plan for acceptance prior to distribution. Distribute the remaining copies of each plan as specified by the RTC. The second and final reports shall be submitted within three (3) weeks of receipt of comments from the RTC.

c. Primary and Secondary Documents. One first draft report (25 copies), one second draft report (25 copies), and one final report (35 bound copies plus the original camera-ready copy and a 3.5 inch disk formatted in WordPerfect 5.1 containing the document file) are required. Incorporate Air Force comments into the second draft and final reports as specified by the RTC. Supply the RTC with an advance copy of the first draft, second draft, and final reports for acceptance prior to distribution. Distribute the remaining copies as specified by the RTC .

d. Provide written notice with supporting documentation within three (3) days of telephone notification and at the direction of the RTC. Assume a maximum of 100 pages.

e. Provide within one (1) week of task/meeting completion.

f. Provide 500 copies of the Newsletters and distribute as agreed to by the RTC. This includes mailing the final product to on-base personnel and addresses on the existing mailing list.

g. Provide draft and final deliverables. Provide two advance copies to the AFCEE RTC and to the 11 CEOS Community Relations Coordinator for acceptance prior to preparation of the final deliverables.

h. Provide poster-size map.

i. Submit with the second draft Technical Report.

j. Submit with the Technical Report.

k. Provide with the Technical Report.

l. Provide within four (4) weeks of task completion.

m. Both a draft and a final addendum to the existing work plan is required for the removal actions specified in paragraph I.1.3.14. Field removal activities performed at Cape Lisburne LRRS pursuant to paragraph I.1.3.14 of this SOW shall commence upon submittal of the draft work plan to AFCEE for review. The Contractor shall distribute both versions of the work plan as specified by AFCEE.

n. The SAP addendum shall focus on the sampling and analysis activities to be conducted under the removal actions specified in paragraph I.1.3.14 of this SOW. The Contractor shall incorporate any Government comments into the final project-specific SAP. The Contractor shall distribute the SAP as specified by AFCEE.

o. A Site Characterization Summary ITIR must be prepared based on the findings of sampling and analyses conducted pursuant to the removal action specified in paragraph I.1.3.14. The Contractor shall incorporate any Government comments into the final ITIR. The Contractor shall distribute the ITIR as specified by AFCEE.

~~Notes:~~

a ~~Unless an abbreviated list of analytes is specified under "Parameter" above, the analytical protocol shall include all analytes listed in the referenced analytical method. The methods cited are from the following sources:~~

~~"A" Methods~~ ~~Standard Methods for the Examination of Water and Wastewater, 16th Edition (1985)~~

~~"E" Methods~~ ~~Methods for Chemical Analysis of Water and Wastes, EPA Manual, 600/4-79-020 (USEPA, 1983--with additions)~~

~~"SW" Methods~~ ~~Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (USEPA, 1986)~~

~~"ASTM" Methods~~ ~~American Society for Testing and Materials, 1919 Race Street, Philadelphia, PA 19103~~

b ~~The maximum number of second-column confirmation analyses shall not exceed fifty (50) percent of the actual number of field samples (to include duplicates, replicates, ambient, condition blanks, trip blanks, and equipment blanks). If the number of samples requiring second-column confirmation exceeds this allowance, contact the HSD Technical Project Manager. The total number of samples listed in Tables A-4 and A-5 includes the allowance applicable to each GC method. IF GC/MS, or a combination of second-column GC and GC/MS, is used, the total cost of all such analyses for a particular parameter shall not exceed the funding allowed for positive confirmation using only second-column GC.~~

REF 68X 68X

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. PAGE 1 OF 3

| 2. PROC INSTRUMENT ID NO. (PIIN) | 3. SPIIN | 4. EFFECTIVE DATE | 5. REQUISITION/PURCHASE REQUEST PROJECT NO. | 6. BCC/DMS RATING |
|---|---|---|---|---|
| F33615-90-D-4010 | 002205 | 20SEP94 | FY7624-94-08822 | |

7. ISSUED BY CODE FA8900

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIAL COMMAND
HUMAN SYSTEMS CENTER
BROOKS AFB TX 78235-5320

Buyer: EDWIN CUSTODIO HSC/PKVBC
Phone: (210)536-4493

8. ADMINISTERED BY (IF OTHER THAN BLOCK 7) CODE S2404A

DCMAO BALTIMORE
ATTN: CHESAPEAKE
200 TOWSONTOWN BLVD, WEST
TOWSON, MD 21204-5299

DUPLICATE ORIGINAL

9. CONTRACTOR NAME AND ADDRESS CODE 69148 FACILITY CODE

IF "Y" FOR MULTIPLE FACILITIES SEE SECT "K"

ICF TECHNOLOGY
9300 LEE HIGHWAY
FAIRFAX VA 22031-1207

PHONE:(703)934-3000
COUNTRY:FAIRFAX

MAIL DATE
SEP 2 3 1994

10. SECURITY CLAS U

11. DISCOUNT FOR PROMPT PAYMENT

1 ST % DAYS
2 ND % DAYS
3 RD % DAYS
NET DAYS
OTHER IF "Y" SEE SECT "E"

12. PURCHASE OFFICE POINT OF CONTACT
MVH/M1E/MVH

13. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 17. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended by one of the following methods:

(a) By signing and returning ____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

14. THIS BLOCK APPLIES ONLY TO MODIFICATION OF CONTRACTS

☐ THIS CHANGE IS ISSUED PURSUANT TO ____ THE CHANGES SET FORTH HEREIN ARE MADE TO THE ABOVED NUMBERED CONTRACT/ORDER.

☐ THE ABOVE NUMBERED CONTRACT IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (SUCH AS CHANGES IN PAYING OFFICE, APPROPRIATION DATA, ETC.) SET FORTH HEREIN.

☐ THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF ____ IT MODIFIES THE ABOVE NUMBERED CONTRACT AS SET FORTH HEREIN.

☒ THIS MODIFICATION IS ISSUED PURSUANT TO FAR 52.232-7 PAYMENT UNDER T&M OR LABOR HOURS

15. CONTRACT ADMINISTRATION DATA

| A. KIND OF MOD | B. MOD ABST RECIPIENT ADP PT | C. DATE OF SIGNATURE MODIFICATION | D. CHANGE IN CONTRACT AMOUNT INCREASE (+) DECREASE (-) | E. LOSING PO/CAO ON TRANSFER | F. GAINING PO/CAO ON TRANSFER | G. SVC/AGENCY USE |
|---|---|---|---|---|---|---|
| C | | | $ SEE SECTION G | | | |

16. ENTER ANY APPLICABLE CHANGES

| A. PAY CODE | B. EFFECTIVE DATE OF AWARD | C. CONTRACT (1) TYPE (2) KIND | D. TYPE CONTR | E. SURV CRIT | F. SPL CONTR PROVISIONS | G. PAYING OFC CODE | H. DATE SIGNED | I. SECURITY (1) CLAS (2) DATE OF DD 254 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

17. REMARKS *(Except as provided herein, all items and conditions of the contract, as heretofore changed, remain unchanged and in full force and effect.)* SUBJECT: INCREASE CEILING AMOUNT/ FUND OVERRUN
PROJECT MANAGER: SAMER N. KARMI, AFCEE/ERDW, BROOKS AFB, TX 78235-5328
FINANCE OFFICE:(SC1030)DFAS-COLUMBUS CENTER, DFAS-CO/CHESAPEAKE DIV
COLUMBUS, OH 43218-2262

18. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ____ COPIES TO ISSUING OFFICE.

19. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*
BY

22. UNITED STATES OF AMERICA *(Signature of Contracting Officer)*
BY

20. NAME AND TITLE OF SIGNER *(Type or print)*

21. DATE SIGNED

23. NAME OF CONTRACTING OFFICER *(Type or print)*
DEAN M. CARSELLO

24. DATE SIGNED
20 SEP 1994

AFMC FORM 702, JUL 92 REPLACES AFSC FORM 702, AUG 84 WHICH IS OBSOLETE

1. Pursuant to FAR 52.232-7 Payment Under Time-and-Material and Labor-Hours Contracts and in accordance with the provisions of the Basic Contract F33615-90-D-4010 and Delivery Order 0022, Mod. 05 the above delivery order is amended. The purpose of this modification is to increase the ceiling amount of this order by $330,000.00 to cover the total cost of the efforts being requested. The ceiling is being increased to cover existing work.

2. As a result of paragraph 1 above, said order is more specifically modified as follows:

a. SECTION A Cover Page: The ceiling amount in Block 20 (cover page) is increased by $330,000.00 from $3,528,878.00 to $3,858,878.00.

b. SECTION B Supplies/Services: is amended as set forth below.

| Item No. | Supplies Schedule | Qty Purch Unit | Unit Price |
|---|---|---|---|
| 0001 | CLIN Change Sec Class: U<br>Noun: Sampling, Analysis, and Data<br>Acrn: XA nsn: N<br>Sites Codes: pqa: D acp: D fob: D | | N |
| 0002 | CLIN Change Sec Class: U<br>Noun: Support<br>Acrn: XA nsn: N<br>Sites Codes: pqa: D acp: D fob: D | | N |
| 0004 | CLIN Change Sec Class: U<br>Noun: Chemical Analysis & Data<br>Acrn: XA nsn: N<br>Sites Codes: pqa: D acp: D fob: D | | N |

pr/mipr data: FY7624-94-08822

b. SECTION G Accounting Classification Data: is amended as set forth below:

| ACRN | Acct Class Data | Appropriation/Lmt Subhead/CPN Recip DODAAD<br>Supplemental Accounting Classification | Obligation Amount |
|---|---|---|---|
| AD | Account Establish | | $330,000.00 |
| | Unclassified | 5743400 F74400<br>304 7434 434419 040000 53475 000000 674400 | |

pr/mipr data: FY7624-94-08822 (PR Complete)

descriptive data: AF Form 616 H94-SR-365 dated: 18 Aug 94 expiration: 22 Sep 94

XA Special ACRN Establish

descriptive data: Special ACRN XA Funds CLINs 0001, 0002, and 0004 and includes the following:

| | | |
|---|---|---|
| AA: | $ 299,855.00 | (Basic DO) |
| AB: | 99,986.00 | (Mod. -01) |
| | 2,899,511.00 | (Mod. -02) |
| AC: | 229,526.00 | (Mod. -04) |
| AD: | 330,000.00 | (Mod. -05) |
| TOTAL | $3,858,878.00 | |

**Finance Officer**: Pay funds in alphabetical order.

3. Concurrence to this Unilateral Agreement is evidenced by contractor's (ICF) letter dated 8 Jun 94, incorporated herein by reference.

4. All other terms and conditions remain unchanged and in full force and effect.

REF 68X 68X

# AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. PAGE 1 OF 4

| PROG INSTRUMENT ID NO. (PIIN) | 3. SPIIN | 4. EFFECTIVE DATE | 5. REQUISITION/PURCHASE REQUEST PROJECT NO. | 6. DOC/DMS RATING |
|---|---|---|---|---|
| F33615-90-D-4010 | 002206 | 27MAR95 | FY7624-95-08452 | DO-C9 |

7. ISSUED BY CODE FA8900

DEPARTMENT OF THE AIR FORCE
AIR FORCE MATERIEL COMMAND
HUMAN SYSTEMS CENTER
8005 9TH STREET
BROOKS AFB TX 78235-5353
Buyer: EDWIN CUSTODIO /PKVBA
Phone: (210) 536-4493

8. ADMINISTERED BY (IF OTHER THAN BLOCK 7) CODE S2404A

DCMAO BALTIMORE
ATTN: CHESAPEAKE
200 TOWSONTOWN BOULEVARD, WEST
TOWSON MD 21204-5299

9. CONTRACTOR NAME AND ADDRESS CODE 69418 FACILITY CODE

ICF TECHNOLOGY, INC.
9300 LEE HIGHWAY
FAIRFAX, VA 22301-3000

COUNTY: FAIRFAX
PHONE: (703)934-3000

"Y" FOR MULTIPLE FACILITIES SEE SECT "K"

ADVANCE COPY

10. SECURITY CLAS U

11. DISCOUNT FOR PROMPT PAYMENT

1ST % DAYS
2ND % DAYS
3RD % DAYS
NET DAYS
OTHER IF "Y" SEE SECT "E"

12. PURCHASE OFFICE POINT OF CONTACT

MVH/M1U/MVH

13. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in block 17. The hour and date specified for receipt of Offers ☐ is extended ☐ is not extended

[illegible]

14. THIS BLOCK APPLIES ONLY TO MODIFICATION OF CONTRACTS

☐ THIS CHANGE IS ISSUED PURSUANT TO ______ THE CHANGES SET FORTH HEREIN ARE MADE TO THE ABOVE NUMBERED CONTRACT/ORDER.

☐ THE ABOVE NUMBERED CONTRACT IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (SUCH AS CHANGES IN PAYING OFFICE, APPROPRIATION DATA, ETC.) SET FORTH HEREIN.

☐ THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF ______ IT MODIFIES THE ABOVE NUMBERED CONTRACT AS SET FORTH HEREIN.

☒ THIS MODIFICATION IS ISSUED PURSUANT TO IAW FAR 52.232-7 PAYMENT UNDER T&M AND LABOR HOURS

15. CONTRACT ADMINISTRATION DATA

| A. KIND OF MOD | B. MOD ABST RECIPIENT ADP PT | C. DATE OF SIGNATURE MODIFICATION | D. CHANGE IN CONTRACT AMOUNT INCREASE (+) DECREASE (-) | E. LOSING PO/CAO ON TRANSFER | F. GAINING PO/CAO ON TRANSFER | G. SVC/AGENCY USE |
|---|---|---|---|---|---|---|
| B | | | SEE SECTION G | | | |

16. ENTER ANY APPLICABLE CHANGES

| A. PAY CODE | B. EFFECTIVE DATE OF AWARD | C. CONTRACT (1) TYPE (2) KIND | D. TYPE CONTR | E. SURV CRIT | F. SPL CONTR PROVISIONS | G. PAYING OFC CODE | H. DATE SIGNED | I. SECURITY (1) CLAS (2) DATE OF DD 254 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

17. REMARKS (Except as provided herein, all items and conditions of the contract, as heretofore changed, remain unchanged and in full force and effect.) SUBJECT: INCREASE TO THE CONTRACT CEILING PRICE

PROJECT MANAGER: SAMER KARMI, AFCEE/ERD, BROOKS AFB TX 78235-5353
FINANCE OFFICE: (SC1030) DFAS-COLUMBUS CENTER, DFAS-CO/CHESAPEAKE DIV
P O BOX 182264, COLUMBUS OH 43218-2264

18. ☒ CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT ☐ CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN ______ COPIES TO ISSUING OFFICE

19. CONTRACTOR/OFFEROR (Signature of person authorized to sign)
BY

22. UNITED STATES OF AMERICA (Signature of Contracting Officer)
BY Janelle J. Larrison

20. NAME AND TITLE OF SIGNER (Type or print)

21. DATE SIGNED

23. NAME OF CONTRACTING OFFICER (Type or print)
JANELLE J. LARRISON

24. DATE SIGNED
95 Mar 27

1. Pursuant to FAR 52.232-7 Payment Under Time-and-Material and Labor-Hours Contracts and in accordance with the provisions of the Basic Contract F33615-90-D-4010 and Delivery Order 0022, Mod. 06 the above delivery order is amended. The purpose of this modification is to increase the ceiling amount of this order by $315,000.00 to cover the total cost of the efforts being requested. The ceiling is being increased to cover existing work in the revised Work Plan.

2. As a result of paragraph 1 above, said order is more specifically modified as follows:

a. SECTION A Cover Page: The ceiling amount in Block 20 (cover page) is increased by $315,000.00 from $3,858,878.00 to $4,173,878.00.

b. SECTION B Supplies/Services: is amended as set forth below.

| Item No. | Supplies Schedule | Qty Purch Unit | Unit Price |
|---|---|---|---|
| 0001 | CLIN Change Sec Class: U<br>Noun: Sampling, Analysis, and Data<br>Acrn: XA nsn: N<br>Sites Codes: pqa: D acp: D fob: D | | N |
| 0002 | CLIN Change Sec Class: U<br>Noun: Support<br>Acrn: XA nsn: N<br>Sites Codes: pqa: D acp: D fob: D | | N |
| 0004 | CLIN Change Sec Class: U<br>Noun: Chemical Analysis & Data<br>Acrn: XA nsn: N<br>Sites Codes: pqa: D acp: D fob: D | | N |

pr/mipr data: FY76-95-08452

c. SECTION F Supplies schedule Data: The delivery schedule is modified as set forth below:

| Item No. | Supplies Schedule Data | | Delivery Quantity | Schedule Date |
|---|---|---|---|---|
| 0001 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | Sec Class: U | 1 | 96 Jan 31 |
| 0002 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | Sec Class: U | 1 | 96 Jan 31 |
| 0004 | CLIN Del Sch Change<br>acrn: XA<br>ship to: U | Sec Class: U | 1 | 96 Jan 31 |

b. SECTION G Accounting Classification Data: is amended as set forth below:

| ACRN | Acct Class Data | Appropriation/Lmt Subhead/CPN Recip DODAAD<br>Supplemental Accounting Classification | Obligation Amount |
|---|---|---|---|
| AE | Account Establish<br>Unclassified | 5753400 F74400<br>305 7434 434419 040000 53440 000000 674400 | $315,000.00 |

pr/mipr data: FY7624-95-08452 (PR Complete)

descriptive data: AF Form 616 H95-SR-298 dated: 1 Mar 95, expiration 15 Sep 95.

XA Special ACRN Establish

descriptive data: Special ACRN XA Funds CLINs 0001, 0002, and 0004 includes the following:

| | | |
|---|---|---|
| AA: | $ 299,855.00 | (Basic DO) |
| AB: | 99,986.00 | (Mod.-01) |
| | 2,899,511.00 | (Mod.-02) |
| AC: | 229,526.00 | (Mod.-04) |
| AD: | 330,000.00 | (Mod.-05) |
| AE: | 315,000.00 | (Mod.-06) |
| | $4,173,878.00 | |

Finance Officer: Pay funds in alphabetical order.

3. Concurrence to this Unilateral Agreement is evidenced by contractor's (ICF) letter dated 18 Jan 95, incorporated herein by reference.

4. All other terms and conditions remain unchanged and in full force and effect.